Post-it® Fax Note 7671	Date 7/2/96	# of pages ▶ 3
To MILDRED FERRE	From L. T. CUSICK	
Co./Dept. VIRGINIA CARBAJAL	Co.	
Phone # CINDY HUNTER 12544	Phone #	
Fax # 66074	Fax #	

Date: 6-27- 1996

To: Patricia W. Phillips, DOE-ORO

From: Mildred S. Ferre', DOE-ORO

Subject: NEPA Categorical Exclusion (CX) for Asbestos Abatement Activities at the Center for Energy and Environment Research (CEER), Mayaguez, Puerto Rico (CX-OFF-509)

The Department of Energy (DOE) Oak Ridge Operations Office (ORO) proposes to perform asbestos abatement at a number of CEER facilities, which would also include the demolition of two small structures. Buildings proposed for asbestos abatement include the chemical storage building, generator building, agriculture shed, laboratory and reactor building, shop building, cooling tower, and several auxiliary units within the buildings (e.g. tanks and corrugated transite "planters", etc.). The action would involve the removal, packaging, and disposal of asbestos containing material (ACM), asbestos containing building materials (ACBM), and presumed asbestos containing materials (PACM) such as man-made mineral fibers, soil, and concrete and metal support components which may be asbestos contaminated. Any necessary sealing of holes, pipes, or penetrations would also be performed. Removal activities would include, as appropriate, HEPA vacuuming, wet wiping, and encapsulation. Work acceptance would be by visual clearance and demonstration of airborne fiber measurement at levels no greater than outside ambient air.

As part of the asbestos abatement, two structures, a wooden cooling tower, and a concrete block chemical storage building, both with transite panels, would be demolished. The remaining concrete bases would be HEPA vacuumed, wet wiped, and encapsulated. Work acceptance would be by visual clearance, area air monitoring, and demonstration of airborne fiber measurement at levels no greater than outside ambient air at a distance of approximately 25 feet.

All proposed activities would comply with appropriate Federal, Commonwealth, and site permits, regulations, and DOE Orders. Activities requiring permits would have permits in place prior to beginning the regulated activity. Uncontrolled or unpermitted releases of hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum products are not anticipated.

Approximately 60 cubic yards of ACM, ACBM, and PACM would be removed and disposed of at an existing commercial facility permitted to accept such waste. Non asbestos wastes would be disposed of at a sanitary landfill.

The proposed action does not involve and would not affect floodplains, wetlands, threatened or endangered species, or archaeologic or historic resources. The structures to be demolished were built between 1958 and 1962 and are not historic.

CER
1440.10

This project would pose no threat of significant individual or cumulative environmental effects. The described action would not be part of an ongoing Environmental Assessment or Environmental Impact Statement. No extraordinary circumstances would be related to this action, and the proposal would not be connected to other actions with potentially significant impacts.

The applicable CX that covers asbestos abatement activities is CX B1.16, DOE NEPA Implementing Procedures, 10 CFR 1021, Subpart D, Appendix B. The applicable CX for building demolition is B1.22, also from the DOE NEPA Implementing Procedures.

The above description accurately describes the proposed action, which reflects the requirements of the CXs cited above. Therefore, I recommend that the proposed action be categorically excluded from further NEPA review and documentation.

Mildred S. Ferre', DOE-ORO Program Manager (or designee) — Date: 6/26/96

Based on my review and the recommendation of the DOE Program Manager, I have determined that the proposed action is categorically excluded from further NEPA review and documentation.

Patricia W. Phillips, DOE ORO NEPA Compliance Officer — Date: 7/2/96

cc: L. T. Cusick, 900 TCB, MS-7607
C. B. Hunter, DOE-ORO
M. S. Ferre', DOE-ORO

Earl Griffin

United States Department of Agriculture
Agricultural Research Service
Office of Director
South Atlantic Area
College Station Road
P.O. Box 5677
Athens, Georgia
30604

Clayton S. Gist, Chief
Decontamination and Decommissioning Branch,
Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, TN 37831

January 23, 1996

Dear Mr. Gist,

We appreciate your letter dated November 21, 1995, updating us on the status of Environmental Restoration activities that the Department of Energy (DOE) is undertaking at the Center for Energy and Environment Research (CEER) facility , Mayaguez, PR. We are pleased to see the progress that is taking place, and the United States Department of Agriculture, Agriculture Research Service (ARS), looks forward to accepting control of the property.

To facilitate the property transfer we request that DOE review and follow the General Services Administration outline of requirements for real property disposal. While many of the required items have been completed we see two significant environmental areas that need to be addressed. They include :

* conducting a lead base paint survey in accordance with the Housing and Urban Development (HUD) revised standards August 1995; and

* performing an environmental site assessment (ESA) in accordance with the current American Society for Testing and Materials (ASTM) standards with intrusive testing as required. The ESA should be conducted by an independent environmental firm to verify that the property meets the current environmental regulatory requirements to protect human health and the environment. We request that the ESA contain a complete set of documents encompassing all DOE remedial activities conducted at the facility. Attached for your information and use is a copy of a draft statement-of-work with the technical provisions we have used when contracting ESA's at our locations.

We would appreciate a status of when this work, as well as the work mentioned in your November 21, 1995 letter will be completed. We hope to receive this update by March 22, 1996 so that we can make plans for accepting control of the facility.

If you have any questions or require additional information, please contact Earl Griffin, Environmental Protection Specialist on (706)546-3574.

Sincerely,

George A. Breeze

Roger Breeze for
Acting Area Director, SAA

cc: Alley
Griffin ✓
Irizarry
Lofton
Reilly
Roark

United States Department of Agriculture
Agricultural Research Service
Facilities Division
6303 Ivy Lane
Greenbelt, Maryland
20770-1433

FEB 04 1994

Dr. William Osburn
Department of Energy
Medical Applications and Biophysical
Research Division - ER-73
Washington, D.C. 20545

Dear Dr. Osburn:

We recently received the "Preliminary Assessment of Asbestos-Containing Materials" and the "Polychlorinated Biphenyl (PCB) Survey Report" for the Center for Energy and Environmental Research in Mayaguez, Puerto Rico. We previously received a copy of the "Site Inspection Report" sent to the Environmental Protection Agency (EPA). Based on this information, our expectations for the cleanup so that the facilities can be transferred back to us are as follows:

- Remove the PCB-contaminated transformers and rewire the remaining transformers to provide electricity for future use by the University of Puerto Rico.

- Perform a comprehensive asbestos-containing material survey as recommended in the Preliminary Assessment of Asbestos-Containing Materials. Based on the results of this survey, remove all friable asbestos-containing material. In addition, remove any unused asbestos-containing products stored on the property.

- Remove or properly abandon-in-place all underground storage tanks except for the large cement reactor water storage tank, which should be decontaminated and closed in accordance with Nuclear Regulatory Commission regulations. Assess the tank sites for environmental damage (soil and ground water contamination), and take corrective actions as necessary.

- Remove and properly dispose of PCB-contaminated soils.

Please forward a copy of any future correspondence that you send or receive from regulatory agencies, as well as progress and/or final reports concerning these matters. Additionally, we have not yet received the following information requested during our July 28, 1993, meeting:

- Documentation indicating that the University of Puerto Rico is satisfied that all remaining chemicals are their property.

- A copy of the preliminary assessment/site investigation initiation letter sent to EPA and to the Environmental Quality Board of Puerto Rico.

Now that you have received our expectations for the cleanup, we look forward to receiving a schedule to mitigate all outstanding environmental concerns. We hope to receive the schedule and other requested information by February 22, 1994. If additional time is needed, please contact Pete Jovanovich, Environmental Protection Specialist, Safety, Health, and Environmental Management Branch, on 301-344-0218.

Your cooperation in this matter is greatly appreciated. We look forward to hearing from you soon.

Sincerely,

TERRY L. ROARK
Chief
Safety, Health, and Environmental
Management Branch

cc:
W. Opfer, SEC
E. Finney, Jr., OA
T. Fox, OGC
M. Carter, SAA
P. Rodriguez, UPR
A. Szilagyi, DOE
J. Espenschade, FD
J. Jensen, RSS
E. Reilly, FD
L. Lofton, SAA
E. Wolfe, SAA
O. Gonzalez, TARS

Mayagüez

AD-424
Nicholson
1/4/94

January 13, 1994

AD-424:RPNicholson

REQUEST FOR EVALUATION OF CLEANUP REQUIREMENTS ASSOCIATED WITH REAL PROPERTY PERMIT TERMINATIONS IN PUERTO RICO

Mildred Siferre', Environmental Restoration Division (ERD)

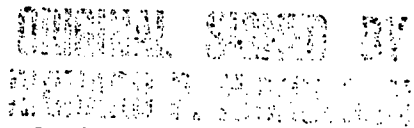
This is in reference to your fax dated November 30, 1993, requesting Real Estate evaluation of the RCRA and CERCLA requirements for cleanup of the sites and facilities permitted to DOE by the Department of Agriculture (DOA) and Forestry Service (FS) in Puerto Rico as addressed in the CERCLA Information Brief, EH-231-022/1193 (November 1993). – See El Verde for copy

We need to recognize that termination of the referenced permits is not defined as a sale or transfer of DOE property. Federal custody and accountability of these sites has always remained with the DOA and FS. The permits issued to DOE were for DOE's temporary use of DOA and FS real property holdings. At such time that DOA and FS accept the sites back from DOE, they will be responsible for any disposal requirements under then existing regulations.

In order to identify any responsibility of DOE to comply with the new requirements, I am requesting the Office of Chief Counsel (CC-10) to review the requirements as they may relate to our temporary use of DOA and FS real property. I will forward CC-10 comments to you upon receipt.

The issues involved with the closeout of responsibilities at the referenced sites are very complex. With additional requirements and changes of requirements, complex issues are being compounded. From a real estate perspective, the liabilities of DOE need to be reduced through the termination of the existing permits. The methods to accomplish this are identified in the attached copy of a memorandum sent to Dane Bartlett, CC-10, dated August 1, 1993 (a copy was sent to Bob Sleeman). The methods suggested may be compatible with appropriate cleanup action.

Should ERD wish to discuss these suggestions, please give me a call and we can schedule a meeting to consider our options. I may be contacted on 6-4431.



Richard P. Nicholson
Realty Officer
Certified Realty Specialist

Attachment

cc: Jennifer Fowler, CC-10

Andy Szilagyi EM-
202 586 9137

DRAFT 7/12/93

CENTER FOR ENERGY AND ENVIRONMENTAL RESEARCH
QUICK LOOK ASSESSMENT

The Office of Facility Transition and Management (EM-60), conducted a Quick Look assessment at the Center for Energy and Environmental Research (CEER) from June 21 to 25, 1993. The site was originally established in 1957 as the Puerto Rico Nuclear Center with the objective of training Latin American students in Nuclear Medicine and Technology. CEER was then established in 1978 to conduct further research in environmental and non-nuclear energy related areas. The activities funded by the Department of Energy (DOE) were terminated at CEER in the mid-1980s with the exception of reactor decontamination and decommissioning, and some limited environmental remediation initiatives.

There are three primary CEER sites located throughout Puerto Rico: El Verde, which is an experimental research station located in the Puerto Rico National Rain Forest; Rio Piedras which primarily focused on Nuclear Medicine research and; Mayaguez which housed the original research reactor and associated laboratories.

CEER facilities have been operated by the University of Puerto Rico (UPR) for over 30 years under contracts with the Department of Energy (DOE) and its predecessor agencies. All buildings (approximately 20) are currently occupied and utilized by the University and/or the United States Forest Service. The land on which these facilities are located is under lease from the United States Department of Agriculture (USDA). To date, the facilities have yet to be transferred from the DOE to the USDA. These facilities all appear to have some degree of contamination and are surplus to the DOE mission and have been

proposed for transfer to the Office of Environmental Restoration and Waste Management (EM).

The DOE Office of Energy Research (ER) is currently the Lead Secretarial Officer with line management responsibility at CEER. Starting in FY 90 and continuing to the present, EM has funded limited clean-up work on site without a formal transfer of responsibility. To date, ER funding and program management have resulted in DOE not meeting all its obligations for environmental, safety, and health requirements at the facilities. Consequently, hazardous material and wastes are currently being stored improperly, building maintenance activities are being funded by UPR, and typically, building renovations have been completed without coordination with or approval by the Department.

our obligations have not been de-Terminated

Information was gathered on the status and condition of the CEER facilities and first order estimates were made of the requirements and resources necessary to support transfer of the CEER to the USDA. Information was obtained through facility walkdowns, inspections, document reviews, and in-depth interviews with cognizant site personnel and USDA representatives. Subsequent to completing the facility walkthrough additional discussions were completed with Oak Ridge Operations Office personnel. Evaluations were made regarding legal, monetary, and programmatic environment, safety and health liabilities associated with CEER. (not RI&E)

1.0 Facility Conditions and Hazards

1.1 Facility Physical Condition

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The majority of CEER facilities reviewed are generally well kept and in adequate physical condition. Structurally, the majority of buildings are in fair condition and present little, if any immediate hazards with the exception of the building currently used to store DOE "orphaned" chemicals at Mayaguez. This building does not meet minimum hazardous material and/or waste storage requirements and incompatible chemicals, gas cylinders, and PCB contaminated soil are currently being stored in this building. As indicated below, short term attention to this problem is needed (i.e., stabilization and removal).

The majority of CEER structures have been constructed with transite asbestos walls and in some instances friable asbestos was observed. from what source? (ceiling)

1.2 Compliance Status

Environment, Safety and Health Liabilities

Several environment, safety, and health (ES&H) issues, as well as potential noncompliance conditions currently exist at CEER facilities. The majority of these issues are related to the facilities located in Mayaguez. They include, but are not limited to, hazardous waste storage under the Resource and Conservation and Recovery Act (40 CFR 262.34 and 40 CFR 262.31), occupational exposure to friable asbestos under the Occupational Safety and Health Administration (29 CFR 1910.1001 and 1910.1101), and PCB containing transformers under the Toxic Substance Control Act (40 CFR 761). ?

The majority of CEER facilities have not been characterized in a systematic manner to determine the nature and extent of contaminants.

Despite ... etc inspection ... survey

A description of the ES&H compliance issues associated with each CEER site is provided below:

El Verde — In September 1968, a tree (Matayba dominguensis) was injected with cesium 137 (Cs-137) in order to study mineral cycling and metabolism. The remaining residual Cs-137 is licensed to UPR by the Nuclear Regulatory Commission (NRC). The presence of radioactive cesium is limited to the area immediately surrounding the tree. Soil excavation and disposal have occurred to further reduce the quantity of remaining Cs-137 and survey's conducted to date indicate that the Cs-137 is not migrating. Potential for public exposure appears to be minimal due to the isolated location of the tree and the fact that the cesium is not migrating. The Forest Service has indicated an interest in maintaining the tree to continue long-term studies. When the El Verde facility, including this tree is, transferred to the Forest Service the NRC license will also have to be transferred. The Forest Service has requested that the tree be fenced off and posted according to radiation protection requirements. In addition the excavated area could be backfilled with clean soil to provide stability at the tree base and function as a radiation barrier/shield.

terminate current Permit & convey all improvements to F.S. Obtain new Permit from DOE for ¼ acre - Fence it and continue to monitor.

needed??

or

One potential PCB transformer (not tested) exists on the El Verde site. Additionally, an operational above ground diesel fuel tank has no secondary containment. (If above ground either convey to F.S. or dispose!)

Test well

Mayaguez — Preliminary characterizations have been performed at the Mayaguez facilities for ES&H issues associated with asbestos, PCBs, and the storage and disposal of "orphan" DOE chemicals on site. Two

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underground storage tanks (empty) have also been identified on site. These tanks have not been registered with the Puerto Rico Environmental Quality Board as required by RCRA Subpart I.

DOE "orphan" chemicals are currently being stored in a building not designed for the storage of hazardous materials or waste. This building is located in the middle of the Mayaguez site. Unknown and potentially incompatible chemicals, gas cylinders, and PCB contaminated soil are being stored concurrently in this building. It is anticipated that these chemicals will be removed from the Mayaguez site and disposed of in a permitted TSD facility by the end of August 1993. If this inventory has not been removed and disposed of within this timeframe, DOE must seriously consider alternative storage methodologies. Storage of hazardous material and wastes in facilities not designed for such use, combined with the long-term storage scenario (i.e., instability resulting in possible explosion) and, concurrent storage of the gas cylinders and PCB contaminated soils constitutes a situation requiring immediate attention by the Department.

Terminate current Permit. Obtain new permit from FS for those facilities & grounds where DOE will continue cleanup.

Transformer modifications can be agreed to in a letter MOA

Four PCB-containing transformers are currently in use at the Mayaguez facility. UPR has been asked to provide the Department with a needs assessment of required electrical capacity at the Mayaguez site. Soil and groundwater sampling investigations conducted in 1992 identified PCB contamination of the soil around the transformers. Historical accounts have established that one

of the three transformers burst, causing PCB contamination of the soil.

Rio Piedras Facilities located at Rio Piedras were transferred to UPR via a Quit Claim Deed in 1982. A recently found underground storage tank (diesel) present on site is likely the responsibility of UPR as a result of the 1982 Quit Claim Deed. Quit Claim Deeds are intended to transfer property "as is." However, the DOE Oak Ridge Operations Office is currently assessing DOE's legal liability regarding the tank.

all-remaining ??

DOE "orphan" chemicals where removed from the site June 26-29, 1993.

If the Quit Claim Deed is enforceable, DOE no longer has any legal responsibility pertaining to the Rio Piedras site unless it is later determined to be a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site.

1.3 Materials Inventory

The majority of the facility structures contain no observed conditions that would represent an acute chemical or radiation hazard, except the facility used to store unknown chemicals, gas cylinders, and PCB contaminated soils in Mayaguez. Transite asbestos walls and asbestos pipe coverings are common in a majority of these facilities. Some friable asbestos was also observed. All underground storage tanks are empty and were used to store fuel with the

exception of an underground concrete storage tank that was used for water retention when the Mayaguez test reactor was operational.

Hazardous materials, such as, asbestos, PCBs, unknown surplus chemicals, and gases have been identified at CEER facilities. No DOE radioactive, mixed radioactive, or special nuclear material were identified. However, there are chemicals and other hazardous materials present throughout the facilities that are the responsibility of UPR. It should be noted that these materials are often stored and maintained in a less than optimum manner, and therefore, the potential for a chemical accident is a concern to the Department.

1.4 High Priority Hazards or Conditions

There are two immediate and/or near-term actions which need to be completed by DOE in order to minimize impacts to the environment, public, and worker safety. The first is to ensure that the "orphan" chemicals, gas cylinders, and PCB-contaminated soils being stored in the Mayaguez facility are removed and disposed of in a timely and suitable manner. Current schedules indicate that this will be accomplished by the end of August. If there is a delay in this schedule, the Department should immediately evaluate and implement alternative storage methodologies (e.g., portable chemical shed) for these hazardous materials and wastes.

The PCB-containing transformers currently in use at the El Verde and Mayaguez sites are subject to Toxic Substance and Control Act (TSCA) requirements which stipulate that PCB-containing transformers with equal to or less than 480 volts must be retrofilled or removed from service by October 1, 1993. The

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four transformers located in Mayaguez include three 150-volt transformers and one 300-volt transformer. The voltage of the transformer located in El Verde is unknown but in all likelihood will also have to be retrofilled or removed from service.

1.5 Deactivation/Stabilization Planning

Activities at CEER, since the mid-1980's, have been fragmented. The Department has initiated several attempts to terminate the lease and transfer the facilities back to USDA and has yet to be successful. Limited clean up work has been completed by EM (i.e., removal of chemicals from Rio Piedras). Planned deactivation and stabilization activities include but are not limited to; removal and/or replacement of PCB-containing transformers, cleanup of PCB-contaminated soil, removal and disposal of "orphan" chemicals, removal of underground storage tanks, where appropriate, the identification and management (i.e., encapsulation or removal of friable asbestos) asbestos and, the transfer, storage, and disposal of CEER records.

The Department, is still in consultation with USDA to determine if following completion of these actions, CEER will be in suitable condition for transfer to USDA.

Funding mechanisms need to be identified and implementation schedules need to be developed to support these activities. It is crucial that a near-term determination be made of what entity within the Department is now responsible for CEER and who will ensure that the necessary deactivation and stabilization activities are completed prior to transfer to USDA.

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2.0 Surveillance and Maintenance (S&M) Activities and Costs

During the review, little evidence of a formal surplus management program or formal surveillance and maintenance program were observed at CEER. It appears that the University of Puerto Rico has funded the majority of building maintenance activities that have occurred at CEER facilities since the mid to late 1980's (this also includes building renovation). "S&M" as traditionally defined by DOE has not occurred. This has been a contributing factor to many of the issues noted during the review. Although not under the preview of this review, the Quick Look assessment team discovered during interviews and document reviews that the Department was several years in arrears to UPR for S&M activities associated with the "BONUS" reactor. These activities consist of an annual inspection and radiological survey conducted by the University.

2.1 Management Control Systems

Energy Research (ER) is currently the lead Secretarial Officer responsible for line management (landlord) of the CEER facilities. EM-40 has funded limited clean-up work on site, which included the removal and disposal of "orphan" chemicals at Rio Piedras. This funding is identified in Activity Data Sheet (ADS) 8301, which is an EM-40 ADS.

To date, ER has not provided adequate funding or program management to meet DOE obligations for environment, safety, and health requirements at CEER. Lack of DOE presence on-site has exacerbated ES&H issues.

2.2 Facility S&M Activities

The lead Secretarial Officer has not identified any current or projected S&M funding for this site, including deactivation and stabilization activities. All deactivation and stabilization activities (with the possible exception of PCB transformer removal; per draft meeting minutes from May 11, 1993) are scheduled to be funded by EM.

2.3 Funding Needs

First order cost estimates for deactivation and stabilization activities were derived from previously developed estimates and documentation received from the Oak Ridge Operations Office. In some instances, a 10 percent contingency factor was added. The total estimated cost for these activities is $$$$$$$$.

Remaining chemicals in Mayaguez	30K
Asbestos Abatement	200K (see Note1)
Replacement of Transformers	125K
Removal of two Underground Storage Tanks	35K (see Note2)
Removal and disposal of PCB contaminated soil	xxxK
Transfer and Storage of Records	12K

Note1 Based on previously conducted Asbestos survey and cost estimates. Current status of the survey is uncertain and the inventory needs to be validated.

Note2 Based on the assumption that the tanks will be removed and no soil contamination is found.

DRAFT

SUMMARY

The CEER Quick Look Team recommends the following actions:

- Transfer CEER to EM-60 in FY94;
- Establish a Tri-Party MOA between EM-60, EM-40 and ER;
- Formalize DOE-DOA transfer agreement;
- Determination of Quit Claim Deed enforceability;
- Removal and proper disposal of chemicals, gas cylinders, and PCB-containing soils stored in Mayaguez. If this cannot be accomplished in a timely and suitable manner these hazardous materials and wastes should be stored appropriately;
- Further characterization and validation of Asbestos inventory and soils, where appropriate; — legality ??
- Retrofill and/or removal from service all PCB-containing transformer prior to statutory deadline and; legal
- Removal of underground storage tanks, where appropriate.

MALCOLM PIRNIE

MALCOLM PIRNIE, INC.
ENVIRONMENTAL ENGINEERS, SCIENTISTS & PLANNERS

January 29, 1993

Ms. Mildred S. Ferre'
Department of Energy
Oak Ridge Field Office
P.O. Box 2001
Oak Ridge, Tenn. 37831

RE: Center for Energy and Environment Research site

Dear Ms. Ferre':

Malcolm Pirnie, Inc. (MPI) is under a Superfund ARCS contract with the United States Environmental Protection Agency (USEPA) to provide pre-remedial services which include Preliminary Assessments, Site Inspections, and Hazard Ranking System Evaluations. The statutory basis for these investigations are contained in the Comprehensive Environmental Response and Compensation and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA).

We have been assigned to perform a Federal Facility Site Inspection Review at the site designated in CERCLIS as the Center for Energy and Environment Research site (EPA ID# PR091899999). In order to perform this work, and on behalf of the USEPA, we are requesting a copy of all of the references cited in the Site Inspection Report dated October, 1992. In addition, we are also requesting a copy of both the four mile radius and fifteen mile surface water pathway maps for this site. This is not a FOIA request, although we have been directed to address this letter to your office on behalf of the USEPA.

If you need additional information or wish to discuss this request, please call me at (609) 860-0100.

Thank you for your consideration and cooperation.

Sincerely,

MALCOLM PIRNIE, INC.

Dennis Stainken, Ph.D.
Manager, Pre-Remedial Program

cc: K. Krishnaswami

104 INTERCHANGE PLAZA CRANBURY, NJ 08512-9543 609-860-0100 FAX: 609-860-0250

DOE F 1325.8
(6-83)

United States Government

Department of Energy

Oak Ridge Operations

memorandum

DATE: May 17, 1990

REPLY TO
ATTN OF: EW-92:Velazquez

SUBJECT: **CENTER FOR ENERGY AND ENVIRONMENT RESEARCH**

TO: Donald J. Cook, Director, Safeguards and Security Division, DP-82

This is in response to your memorandum of March 7, 1990, same subject as above. A major DOE facility that in the past contained nuclear materials was the Center for Energy and Environment Research (CEER) in Mayaguez, Puerto Rico. A decontamination of this facility was completed in 1987 and final shipment of nuclear material was received in Oak Ridge during the early part of 1989 for final disposal at Hanford. We have requested Mr. J. Newman, Procurement and Contracts Division, to take the necessary action to remove this facility from the "229" boundary designation category.

All personal property at this facility has been transferred to the University of Puerto Rico. In the future we will transfer this facility as well as two other small buildings at El Verde Research Site to the Agricultural Research Service and U.S. Forest Service of the U. S. Department of Agriculture, respectively.

Based on the above actions we have determined that the CEER facilities should not be included in Safeguards and Security Division's property protection reviews. If you have any questions or require additional information on this matter, please contact Luis Velazquez of my staff at 6-0731.

Larry L. Radcliffe, Director
Waste Management Division

cc:
J. Newman, AD-42

DOE F 1325.8
(5-83)

United States Government

Department of Energy

Oak Ridge Operations

memorandum

DATE: February 12, 1990

REPLY TO
ATTN OF: AD-424:JRNewman

SUBJECT: CLEANUP AND RESTORATION OF THE EL VERDE AND MAYAGUEZ SITES IN PUERTO RICO

TO: P. D. Dayton, AD-42
R. E. Lynch, AD-42
R. P. Nicholson, AD-42
L. Radcliffe, DP-85
L. Velazquez, DP-85
D. Underwood, DP-85
L. Clark, DP-85

This summarizes a January 24, 1990, meeting which was held to determine the status of characterization of the Mayaguez and El Verde sites, including funding to accomplish necessary cleanup and restoration prior to realinquishment of DOE custody. Those in attendance were: Luis E. Velazquez, Larry Radcliffe, Jack Newman, Pat Nicholson, and Steve Morrell. While discussing the requirements for and status of cleanup and restoration work, Larry Radcliffe requested that Velazquez take the following action:

1. Have ORNL finalize the characterization report and submit it to DOE.

2. Continue pressing the issue concerning release of the uncontaminated reactor cooling water with the Puerto Rico Aqueduct and Sewer Authority. Velazquez indicated that this issue is close to resolution and a permit to release considering DOE's comments should be forthcoming in the very near future.

3. Obtain HQ-ER involvement with respect to the radioactive trees, etc., at El Verde. It was brought out in the meeting that ORNL had found high levels of radioactivity at the sites. Although the Forest Service has advised that they will accept the radioactive trees, Radcliffe is uncomfortable because he felt DOE would remain responsible for ultimate cleanup, liability, etc. Luis is to pursue this with Legal to ascertain legal ramifications, and determine whether an agreement for transfer is possible under current laws and regulations governing the control and management of radioactive materials.

4. Bring cost requirements together for cleanup and restoration and prepare funding request to Headquarters. It was brought out that cognizant Headquarters program offices are now denying responsibility for any further cleanup costs, etc. He said a funding request would still be submitted for Headquarters review and response.

It was also agreed that Nicholson and Newman would proceed with ascertaining what restoration requirements that USDA and USFS would require over and above contaminated cleanup work. In this regard, RE is proceeding with setting up a meeting with cognizant USFS representatives in Atlanta to discuss transfer details and restoration requirements for El Verde.

With respect to the letter of October 17, 1989, from Mr. Robert B. Waide, CEER, to Richard L. Egli, requesting funds in the amount of $53,000 to repair damage incurred at the El Verde site during Hurricane Hugo, Radcliffe agreed that only damage which has created safety hazards or problems should be corrected.

Comments on specific items identified in Mr. Waide's letter were:

a. Walk-up tower and canopy walkway - Funds had been requested in the amount of $20,000 to repair the tower and canopy walkways. It was agreed that we would fund only for the elimination of safety hazards. This would involve removal of the damaged tower and walkways.

b. Entrance road and trails - It was agreed that repair of the roads and trails to eliminate any safety hazards should be accomplished.

c. Power - It was agreed that DOE would not fund the replacement of the power line to the DOE facilities at El Verde. It was brought out in the meeting that UPR was most likely interested in restoring power so that it could continue ongoing research work for NASA. Radcliffe said that we should not expend DOE funds to assure power for research work being accomplished for another federal agency. The matter of UPR research work at El Verde needs to be clarified since the El Verde site is still under permit to DOE. This raises questions as to DOE's liability. Also, such work could result in increased environmental and safety problems for DOE in restoring the site for acceptance by USFS. It was felt that repair of the generator was justifiable for health and safety reasons. Also, it was ascertained subsequent to the meeting that the generator was acquired from USFS as a part of the use agreement and, as such, should be restored to an operable condition. In a subsequent conversation with a representative of the USFS at El Verde, we were advised that electric power via the power line had been restored to the site.

d. Structural damage - It was agreed that structural repairs required for health and safety reasons and to preclude further damage to the building should be accomplished. Any restoration over and above that should be deferred until the USFS advises us as to what restoration will be required prior to returning El Verde to the custody of the USFS.

Velazquez advised that Headquarters had provided only $27,000 for repairing damage caused by Hugo. Radcliffe reiterated that the only repairs he wanted made were those necessary to eliminate health and safety hazards as documented above, and that Mr. Waide be notified of our decision.

Steve Morrell said that in a subsequent meeting, Ms. Helen McCammon, Headquarters (ER-75), requested that all of the $27,000 be released to CEER to accomplish repairs necessary for health and safety reasons. Morrell said he expects to receive a procurement request to modfify the CEER contract to make the funds available.

Jack R. Newman
P&C Division

AD-424

RPNicholson

11/21/91

4360.53

NOV 21 1991

Mr. Hugh Johnson
U. S. Department of Agriculture
ARS
South Atlantic Area
P. O. Box 5677, College Station Road
Athens, Georgia 30613

Dear Mr. Johnson:

Enclosed for your information is a package of material regarding Department of Energy's (DOE) cleanup efforts at the Mayaguez, Puerto Rico site.

This information will provide the background for the correspondence previously transmitted to your office relative to our funding request to DOE Headquarters.

Please give me a call on FTS 626-4431 if you have any questions.

Sincerely,

ORIGINAL SIGNED BY
RICHARD P. NICHOLSON

Richard P. Nicholson
Realty Officer

Attachments

Ltr dtd 10-10-90
Ltr dtd 9-18-90
Undated ltr to Nimia Irizarry from Osvaldo Rosario

PRELIMINARY ASSESSMENT OF ASBESTOS-CONTAINING MATERIALS WITHIN THE CENTER FOR ENERGY AND ENVIRONMENTAL RESEARCH FACILITIES IN PUERTO RICO

F. K. Edwards, Jr.

B. D. Wilson

October 05, 1989

PRELIMINARY ASSESSMENT OF ASBESTOS-CONTAINING MATERIALS WITHIN THE CENTER FOR ENERGY AND ENVIRONMENTAL RESEARCH FACILITIES IN PUERTO RICO

INTERNAL DISTRIBUTION

1. D. T. Duncan
2. F. K. Edwards, Jr.
3. T. H. Row
4. J. H. Swanks
5. B. D. Wilson

EXTERNAL DISTRIBUTION

6. D. Underwood — U.S. Department of Energy, Oak Ridge Operations
7. L. E. Velazquez — U.S. Department of Energy, Oak Ridge Operations

CONTENTS

ACKNOWLEDGMENTS

The authors gratefully acknowledge the contribution of the following persons:

- R. B. Ogle for information and recommendations provided.
- B. A. Jerome and N. D. Bowles for analysis of asbestos samples.
- S. E. Capps for secretarial services.

EXECUTIVE SUMMARY

This report presents the results of a preliminary assessment of asbestos-containing materials (ACM) at the Center for Energy and Environmental Research (CEER) in Puerto Rico. The work was carried out by the Oak Ridge National Laboratory (ORNL) for the Department of Energy (DOE). The effort consisted of performing visual inspections, collecting limited numbers of bulk samples, providing analytical results, assessing current conditions, and providing alternatives to minimize the potential for exposures. A more comprehensive survey utilizing building blueprints and piping diagrams will be required to locate, map, quantify, and record condition, accessibility and potential for fiber release. Future regulations and intended use of these facilities will influence available alternatives. There is no known safe level of asbestos exposure, therefore attention should be given to maintaining all exposures to as low as reasonably achievable (ALARA).

INTRODUCTION

The purposes of this study were to make a preliminary assessment of the status of ACM's at the CEER and associated facilities, evaluate the potential for asbestos exposure, and review feasible control alternatives.

There were approximately 10 facilities reviewed at the Mayaguez site varying from reactor buildings, laboratories, and shops, to storage areas. At the El Verde Research site, a variety of building materials were sampled which included acoustical ceiling tile, floor tile, and Durotex^{R} wall board and interior wall partitions. At the CEER biomedical facility in Rio Piedras, a limited number of samples were taken in conjunction with a thorough visual walk-through. The Cornelia Hill site was also visited and a cursory inspection was performed.

Fifty-five percent of the samples contained greater than 1 percent asbestos. Precautions should be taken when performing work in those areas reported or suspected of containing asbestos. When ACM's are disturbed during maintenance, repair, or renovation, they may become airborne, and these situations would be subject to various regulatory requirements. Requirements vary in many areas; therefore applicable local regulations should be consulted to ensure regulatory compliance.

NATURE OF THE ASBESTOS HAZARD

Asbestos is a generic name given to fibrous mineral silicates. In the past, these minerals have been widely used in materials that required their characteristic heat and chemical resistance. The most common types of asbestos found in insulation products are chrysotile, amosite, and crocidolite. In recent years, these minerals have received considerable attention because of their high toxicity to humans. Three major diseases are associated with exposure to airborne asbestos fibers:

1. Chronic exposure to high levels of airborne asbestos has been shown to cause a debilitating, and often fatal, lung disorder called asbestosis.
2. Any level of exposure to asbestos increases the risk of lung cancer; there is a dramatic increase in the risk of lung cancer for those who smoke and are exposed to asbestos.
3. Similarly, exposure to asbestos will increase the risk of mesothelioma, a fatal cancer of the lining of the pleural or peritoneal cavity.

Although research has indicated that there is a different degree of risk associated with the various types of asbestos, present governmental regulations do not make a distinction of asbestos by types.

INDUSTRIAL HYGIENE SURVEY OF ACM

The ACM was assessed for its current condition as well as its potential for future disturbance, damage, or erosion. Subjective factors used to evaluate current conditions included evidence of deterioration, physical damage, and water damage. The potential for future disturbance, damage, or erosion was evaluated by observing the proximity to an air plenum or direct airstream, the visibility and accessibility, the degree of activity, and the change in building use. Bulk samples were taken to identify and determine the percentage of asbestos present.

Visual Inspection

The visual inspection revealed some friable ACM with moderate deterioration/damage which was probably inflicted during routine maintenance procedures. This is illustrated in Photograph Number MGA-013.

Damage to pipe/boiler insulation covering caused friable asbestos to be exposed. Photograph Number MGA-010.

Packing materials, gasket materials, and ruptured bags of loose ACM are stored and accessible on open shelves. Some of these materials are labeled as being ACM.

Bulk Samples

Bulk samples of suspect ACM were taken to identify and determine the percentage of asbestos present. Various types of insulating materials were sampled to characterize the nature of ACM usage. Every effort was made to collect samples in areas of existing damage in order to minimize further disturbance of the suspect materials.

The analysis of the samples for asbestos was performed using EPA-recommended methods of polarizing light and dispersion staining techniques. The Industrial Hygiene section at ORNL is a "proficient" participant in the EPA Analytical Proficiency Program.

Areas not sampled but suspected of containing asbestos were identified for future reference.

CONCLUSION FROM INDUSTRIAL HYGIENE SURVEY

Based upon visual inspections, insulating materials are, for the most part, in fair condition with some noted exceptions. These exceptions most likely are related to disturbance and damage that occurred as a result of maintenance activities. Because of the low potential for disturbance and exposure in most of these locations, the materials do not pose a direct threat. If friable materials are disturbed, through maintenance and cleaning activities, fibers could be released increasing the potential to cause health effects if they are inhaled. Maintenance and custodial personnel performing activities in these areas should be made aware of the location of ACMs. Information regarding the health effects associated with asbestos and measures to prevent exposure should be provided to maintenance and custodial staff members.

Immediate action should be taken to cleanup and properly dispose noted asbestos debris and all unused products in storage that contain asbestos. Work involving repairs, renovation, and clean-up should be conducted by individuals who are medically approved, trained, and protected as required by the Occupational Health and Safety Administration (OSHA) regulations, Title 29 CFR 1926.58. Any future work involving ACM or suspect ACM, such as maintenance and inspection activities, should be performed by trained and protected workers.

All material identified as containing asbestos should be labeled per 29 CFR 1926.58. A formal Operations and Maintenance (O&M) program for controlling occupational exposures should be instituted until a permanent control measure can be enacted. Encapsulation may be used to control the risk posed by broken pipe coverings that expose friable materials. While an effective O&M program can ensure that adequate exposure control is achieved, the recommended and ultimate control measure is removal of asbestos-containing materials.

SAMPLE RESULTS

October 5, 1989

Identification of Bulk Samples for Asbestos Content

An analysis was performed on bulk samples of material suspected of containing asbestos fibers. These samples were collected from the Laboratory Building Basement (Building F) at CEER in Mayaguez on June 12, 1989. The results are as follows:

Sample No.	Location	Results
MGA-001	Northwest corner of basement, outer covering over fiberglass on pipe running south to north approximately 8 feet off floor.	Positive (Chrysotile 1-5%) in adhesive
MGA-002	Northeast wall of basement, low pressure steam line, sample taken of open end at valve.	Negative
MGA-003	Northeast corner of basement, black coating on foam surrounding an Allis-Chalmers pump	Positive (Crocidolite 1-5%) Mixed with fiberglass
MGA-004	Piping on south end of unit on Absorption Cold Generator (at main entrance), silver-like paper coating over fiberglass	Negative
MGA-005	At main entrance to basement, exposed elbow on overhead line (approximately 6-1/2 feet up) running west to east, 5 feet beyond main entrance.	Negative
MGA-006	At main entrance, process hot water line, exposed end of copper pipe running parallel, then perpendicular to MGA-005	Negative
MGA-007	Green colored insulation in central area of room near gray covered tank approximately 4 feet off floor, open end pipe insulation.	Negative
MGA-008	Large gray insulated tank approximately eight feet off floor and centrally located in basement, sampled at damaged area under west end of tank.	Positive (Chrysotile 10-20%)

MGA-009	Large gray insulated tank located approximately 4 feet off the floor in central area of basement, sample taken at damaged west end of tank at valve. Tank needs repair in several locations.	Positive (Chrysotile 10-20%)
MGA-010	Green colored pipe insulation at west end of gray tank which is located 4 feet off floor, open end pipe insulation. In poor condition, needs repair.	Positive (Amosite 10-25%)
MGA-011	Green colored insulated line approximately three feet off floor directly west of styrofoam enclosed area, open end pipe insulation near float and thermostatic trap. Entire area is in poor condition.	Positive (Chrysotile 15-30%)
MGA-012	Room 1 in Basement, gasket material on shelves	Positive (Chrysotile 15-25%)
MGA-013	Large green vertical pipe east of Progress Boiler, east side at damaged valve area.	Positive (Amosite 10-20%)
MGA-014	Grayish-white process hot water line at east wall of basement in north area near Progress Boiler, sample of joint area of insulated line. Good condition except at bracing.	Positive (Amosite 25-50%)
MGA-015	Far east storage room in basement, block mix material stored on shelf at left wall beyond wooden doors, sample taken from broken bag.	Positive (Amosite-Chrysotile 30-60%)
MGA-016	Far east storage room in basement, thick black sheet of material in southeast corner	Positive (Chrysotile 750%)
MGA-017	Open end of large green colored insulated line located directly over Progress Boiler in basement area.	Positive (Amosite-Chrysotile 35-60%)
MGA-018	Black sticky wrap on west wall, south of fire extinguisher sign	Negative
MGA-019	Green colored low pressure steam line in set of piping located on south end of Progress Boiler	Positive (Chrysotile 25-50%)

Positive identification of asbestos material may require that action be taken to repair, remove, and clean up areas so identified. All such activities must comply with current guidelines and procedures for handling asbestos-containing materials, and must be under the direction of a certified "Competent Person" as defined in 29 CFR 1926.58. A high priority response should be given to employee work stations and areas where personnel traffic is heavy.

Negative identification of asbestos material requires no followup; but workers should be cautious of changes in material content, texture, color, and overall appearance. If suspicious material is encountered, please have the material sampled and analyzed for asbestos content.

October 5, 1989

Identification of Bulk Samples for Asbestos Content

An analysis was performed on bulk samples of material suspected of containing asbestos fibers. These samples were collected from the Reactor Building (Building G) at CEER in Mayaguez on June 12, 1989 and June 13, 1989. The results are as follows:

Sample No.	Location	Results
MGA-020	Second floor of Reactor Bay, sample of white floor tile in main bay area	Positive (Chrysotile 1-5%)
MGA-021	Second floor, sample of white floor tile in control room	Negative
MGA-022	Second floor, exposed area of pipe insulation located overhead on west wall outside of Room 226, bottom line.	Positive (Amosite 25-50%)
MGA-023	Second floor, Room 224 glued on acoustical ceiling tile.	Negative
MGA-024	Second floor, Room 225 acoustical ceiling tile	Negative
MGA-025	Second floor, insulation off A/C duct, above the ceiling tile in control room	Negative
MGA-026	Second floor, Room 226, sample of dark brown floor tile	Positive (Chrysotile 1-5%)
MGA-027	Second floor, HVAC insulation in northwest corner of main bay	Negative
MGA-028	Second floor, exposed end of upper insulated line in far northwest corner.	Positive (Amosite 10-20%)
MGA-029	First floor, Room 134, suspended ceiling tile with small holes, also in rooms 132 and 133	Negative
MGA-030	First floor, Room 135, suspended ceiling	Negative
MGA-031	First floor, Room 134, smooth type of suspended ceiling	Negative

Positive identification of asbestos material may require that action be taken to repair, remove, and clean up areas so identified. All such activities must comply with current guidelines and procedures for handling asbestos-containing materials, and must be under the direction of a certified "Competent Person" as defined in 29 CFR 1926.58. A high priority response should be given to employee work stations and areas where personnel traffic is heavy.

Negative identification of asbestos material requires no followup; but workers should be cautious of changes in material content, texture, color, and overall appearance. If suspicious material is encountered, please have the material sampled and analyzed for asbestos content at once for identification.

October 5, 1989

Identification of Bulk Samples for Asbestos Content

An analysis was performed on bulk samples of material suspected of containing asbestos fibers. These samples were collected from the Administration Building (Building J) at CEER in Mayaguez on June 13, 1989. The results are as follows:

Sample No.	Location	Results
MGA-032	Acoustical ceiling tile in main hallway and offices.	Negative
MGA-033	New acoustical ceiling tile located in cases at southwest end of building in dock area.	Negative

Negative identification of asbestos material requires no followup; but workers should be cautious of changes in material content, texture, color, and overall appearance. If suspicious material is encountered, please have the material sampled and analyzed for asbestos content at once for identification.

October 5, 1989

Identification of Bulk Samples for Asbestos Content

An analysis was performed on bulk samples of material suspected of containing asbestos fibers. These samples were collected from the Shop Building (Building H) at CEER in Mayaguez on June 13, 1989. The results are as follows:

Sample No.	Location	Results
MGA-034	On west wall, uncovered white pipe insulation leaning against wall, also associated debris. This should be cleaned up immediately.	Positive (Chrysotile 25-50%)
MGA-035	Large piece of pipe insulation in trash container just inside entrance at northwest area.	Negative

Positive identification of asbestos material may require that action be taken to repair, remove, and clean up areas so identified. All such activities must comply with current guidelines and procedures for handling asbestos-containing materials, and must be under the direction of a certified "Competent Person" as defined in 29 CFR 1926.58. A high priority response should be given to employee work stations and areas where personnel traffic is heavy.

Negative identification of asbestos material requires no followup; but workers should be cautious of changes in material content, texture, color, and overall appearance. If suspicious material is encountered, please have the material sampled and analyzed for asbestos content at once for identification.

October 5, 1989

Identification of Bulk Samples for Asbestos Content

An analysis was performed on bulk samples of material suspected of containing asbestos fibers. These samples were collected from the Agro-Bio-Science Building (Building C) at CEER in Mayaguez on June 13, 1989. The results are as follows:

Sample No.	Location	Results
MGA-036	Glued on acoustical ceiling tile	Negative

Negative identification of asbestos material requires no followup; but workers should be cautious of changes in material content, texture, color, and overall appearance. If suspicious material is encountered, please have the material sampled and analyzed for asbestos content at once for identification.

October 5, 1989

Identification of Bulk Samples for Asbestos Content

An analysis was performed on bulk samples of material suspected of containing asbestos fibers. These samples were collected from the Cornelia Hill Storage Site in Mayaguez on June 13, 1989. The results are as follows:

Sample No.	Location	Results
CHA-001	Wall board from south wall of storage room	Positive (Chrysotile 80%)

Positive identification of asbestos material may require that action be taken to repair, remove, and clean up areas so identified. All such activities must comply with current guidelines and procedures for handling asbestos-containing materials, and must be under the direction of a certified "Competent Person" as defined in 29 CFR 1926.58. A high priority response should be given to employee work stations and areas where personnel traffic is heavy.

October 5, 1989

Identification of Bulk Samples for Asbestos Content

An analysis was performed on bulk samples of material suspected of containing asbestos fibers. These samples were collected from the New laboratory Building at El Verde Research Site on June 14, 1989. The results are as follows:

Sample No.	Location	Results
EVA-001	Brown floor tile sample taken at the front entrance on the right.	Negative
EVA-002	Acoustical ceiling tile with small design	Negative
EVA-003	Roofing material	Negative
EVA-004	Wall board material, sample taken above the ceiling tile at the top of wall board, second lab on the left beyond the main entrance.	Positive (Chrysotile 80+)
EVA-005	Acoustical ceiling tile with large design	Negative
EVA-006	Corrugated roofing material on generator room building.	Positive (Chrysotile 10-20%)

Positive identification of asbestos material may require that action be taken to repair, remove, and clean up areas so identified. All such activities must comply with current guidelines and procedures for handling asbestos-containing materials, and must be under the direction of a certified "Competent Person" as defined in 29 CFR 1926.58. A high priority response should be given to employee work stations and areas where personnel traffic is heavy.

Negative identification of asbestos material requires no followup; but workers should be cautious of changes in material content, texture, color, and overall appearance. If suspicious material is encountered, please have the material sampled and analyzed for asbestos content at once for identification.

October 5, 1989

Identification of Bulk Samples for Asbestos Content

An analysis was performed on bulk samples of material suspected of containing asbestos fibers. These samples were collected from the University Biomedical Building in Rio Piedras on June 14, 1989. The results are as follows:

Sample No.	Location	Results
BBA-001	Room 242, open end of pipe insulation located at wall opposite doorway	Positive (Chrysotile 50-75%)
BBA-002	Insulated gloves found in Room 242	Positive (Chrysotile 90%)
BBA-003	Room 331, tape wrapping on distillation column located in sink	Positive (Chrysotile 80%)
BBA-004	Room 331, wire support at distillation column	Positive (Chrysotile 80%)
BBA-005	Boiler room, exposed elbow of pipe insulation, most is in good condition but some has water damage.	Positive (Chrysotile 25-50%)
BBA-006	Room 112, insulated tank inside transite walls, in generally good condition but may need to be repaired in some areas.	Positive (Chrysotile 10-20%)

Positive identification of asbestos material may require that action be taken to repair, remove, and clean up areas so identified. All such activities must comply with current guidelines and procedures for handling asbestos-containing materials, and must be under the direction of a certified "Competent Person" as defined in 29 CFR 1926.58. A high priority response should be given to employee work stations and areas where personnel traffic is heavy.

Bulk samples were not collected in all areas. Suspect asbestos-containing materials, listed below, were identified and labeled as needing to be sampled at a later time. Sampling, in addition to these locations, should be performed in order to further characterize the materials in question.

In the Laboratory Building Basement at CEER in Mayaguez, the following locations were labeled and are suggested areas to be sampled:

Label No.	Location
MGAS-001	Northwest corner of basement, black foam-like material approximately 10 feet off floor.
MGAS-002	Northwest corner of basement, large black elbow on fiberglass line above induction motor starter.
MGAS-003	Northeast corner of basement, elbow on low pressure green painted steam line and associated elbows on the same line. Also, the straight sections may have a thin asbestos mud coating or wrap over fiberglass.
MGAS-004	Northeast corner of basement, white process hot water line elbow and associated elbows. Also, the straight sections on the east wall should be sampled.
MGAS-005	Green painted 2-inch hot water line located approximately 6-1/2 feet overhead near main entrance. Elbows and straight sections should be checked.
MGAS-006	Unlabeled green painted line running north to south. Joints and areas where bracing is located should be checked.
MGAS-007	Green painted pipe line approximately 8 feet off the floor and running north to south near east boxed in styrofoam area. Straight sections and ends should be sampled.
MGAS-008	Green painted line approximately 8 feet up and beside MGAS-007. Elbows and straight sections should be sampled.
MGAS-009	Inside white styrofoam boxed in area against east wall. Debris and pipe insulation have been removed and left in the area. Material is in poor condition and needs attention.
MGAS-010	Green painted line running west to east and located 6 feet off the floor and above the float and thermostatic trap. Elbows, joints, and straight sections should be sampled.

MGAS-011	Gray process hot water line located in the central area of the room and running into the east wall white process hot water line.

Note: In Room 1, storage area on the west side of the basement, there are numerous gaskets, packing material, rope, etc., located on the shelves. Many of these materials are suspect and some are in original container which are labeled as containing asbestos.

Note: In the central area of the basement, a green painted suspect process water line appears to have been covered over with foam and duct tape. This is not readily apparent and should be noted.

In the Reactor Building at CEER in Mayaguez, the following locations were labeled and are suggested areas to be sampled:

Label No.	Location
MGAS-012	Floor tile on the second floor in Rooms 224, 225, 226, 227, and in the room west of the Reactor Control Room.
MGAS-013	On the second floor in the northwest corner, elbow on the vertical gray pipe.
MGAS-014	On the first floor, the overhead insulated pipe just inside the main north entrance. Elbows and straight sections should be sampled.
MGAS-015	On the first floor, the insulated pipe above the entrance to Room 125, in hallway. Elbows and straight sections should be sampled.
MGAS-016	In the basement, a low pressure steam line near the north wall, east area. Good condition.
MGAS-017	In the basement, process hot water line near the north wall, east area. Elbows and straight sections should be sampled. Good condition.

Note: In the basement, at the top of stairs in the northeast corner through Room 129, there are several rooms containing various suspect materials. These include counter tops, overhead pipe insulation, floor tile, cabinet walls, wallboard, pipe chases, etc.

At CEER in Mayaguez, in some locations, bulk samples were not taken of suspect asbestos-containing materials, nor were the areas marked as suspect. However, brief visual inspections were conducted and comments pertaining to particular buildings/areas are listed below.

Building	Suspect Material
Marine Biology Lab (Building D)	Suspect material on the east side of the main building, the small shack has suspect corrugated board under the metal roof.
Marine Biology Lab (Building D)	In the west room, heating jackets and a white oven are suspect.
Marine Biology Lab (Building D)	At the east side of the main building, the corrugated board at the outside wall is suspect.
Marine Biology Lab (Building D)	Floor tile and mastic in all rooms are suspect.
Shack (Building K)	The 1/2-inch wall board and corrugated ceiling are suspect. The building is in good condition and should remain so unless someone damages it. One area at the west wall is cracked and can be repaired.
Administration (Building J)	The floor tile is suspect.
Shop (Building H)	A suspect sheet of gasket material is on the top shelf of west wall.
Shop (Building H)	Just inside the main northwest door, two rolls of black felt-like material are suspect.
Shop (Building H)	Inside a cabinet, on the north wall, there is a roll of suspect cloth.
Shop (Building H)	Behind the above cabinet, there is a 3/4-inch suspect piece of board with holes.
Shop (Building H)	Gasket material on the shelf in second room to south, Room S-6 is suspect.
Shop (Building H)	White wrap on overhead pipe near the center of room is suspect. The pipe runs south into a caged area and terminates in an electric shop.
Shop (Building H)	Upstairs area, floor tile and mastic is suspect.
Agro-Bio-Science Laboratory (Building C)	The floor tile is suspect as well as black bench tops and sink.

Small Cooling Tower	There is corrugated suspect wall board.
Small Shack East of H Building	The floor linoleum is suspect.
"Corral" (Building E)	The floor linoleum is suspect.
Agricultural Shed (Building M)	The roof is corrugated suspect material and is in very good condition.
Agricultural Shed (Building M)	Door and wall panels are suspect.
Miscellaneous Areas	Between B and C buildings, a sticky suspect black wrap is located approximately 10 feet up.
Miscellaneous Areas	In the utility shed south of B building, there are two suspect tables.
Miscellaneous Areas	Outside the generator building located at the northeast corner of H building is a suspect elbow on an exhaust line at southwest corner. The material is in poor condition.

At Cornelia Hill in Mayaguez, a brief visual inspection was conducted in order to identify suspect asbestos-containing materials. These materials included:

1. The corrugated roof of a storage building.
2. Wall board in several buildings.
3. Floor tile in the main building.
4. Acoustical ceiling tile in the main building.
5. At the small building, north of the Environmental Lab, there is suspect wrap at the air unit.

At the University Biomedical Building in Rio Piedras, limited bulk sampling was performed, however, a visual inspection of requested rooms/areas was conducted. Suspect materials included:

Location	
Room 224	1. Floor tile and mastic 2. Acoustical ceiling tile 3. Pipe insulation above the suspended ceiling 4. Hoods with wall board (good condition)
Room 242	1. Floor tile and mastic 2. Acoustical ceiling tile 3. Pipe insulation above suspended ceiling 4. Lab supplies, gloves, etc.

Room 301	1. Black counter tops in center of room 2. Floor tile and adhesive 3. Acoustical ceiling tile 4. Two hoods with suspect walls, good condition 5. Pipe insulation above suspended ceiling
Room 331	1. Six hoods with suspect walls, good condition 2. HVAC system above suspended ceiling 3. Acoustical ceiling tile 4. Floor tile and mastic
Third Floor Roof	1. Roofing materials, tar paper, etc., all in good condition 2. Corrugated roof material over the transformer house 3. Pipe insulation, in very good condition
Fourth Floor Roof	1. Nine to ten hood exhaust ducts, in good condition 2. At exhaust shrouds, suspect board 3. Pipe insulation on old HVAC 4. Roofing material, in good condition
Room 112	1. Floor tile and mastic 2. Wall board material around boiler, good condition

ALTERNATIVES

The three alternatives described below are based on guidance from the United States EPA for controlling ACM in buildings. The alternatives are:

Alternative 1: Establishing a special operations and maintenance program

Alternative 2: Encapsulation with sealants

Alternative 3: Removal, disposal, and replacement

Alternative 1 is designed to (1) clean up asbestos fibers previously released, (2) prevent future releases by minimizing the disturbance or damage of ACM, and (3) monitor the condition of the ACM. This program should continue until all ACM is removed or the building is demolished. Implementation of this alternative will only ensure better control over the environment than now exists.

Alternative 2 would bind together the asbestos fibers and other material components to offer some resistance to damage from impact.

Alternative 3 would remove the ACMs, transport the material to an approved landfill, and reinsulate with asbestos-free material. Completion of this alternative would eliminate the need for an O&M Program.

Appendix A. ASBESTOS GLOSSARY

ASBESTOS GLOSSARY

Airborne Asbestos	Determination of the amount of asbestos fibers suspended in a given amount of air.
Air Monitoring	The process of measuring the airborne fiber concentration of a specific quantity of air over a given amount of time.
Air Plenum	Any space used to convey air in a building or structure. The space above a suspended ceiling is often used as an air plenum.
Amosite	An asbestiform mineral of the amphibole group containing approximately 50 percent silicon and 40 percent iron oxide, and is made up of straight, brittle fibers, light gray to pale brown in color.
Asbestos	A generic name given to a number of naturally occurring mineral silicates that possess a unique crystalline structure, are in combustible in air, and are separable into fibers. Asbestos includes the asbestiform varieties of chrysotile (serpentine); crocidolite (riebeckite); amosite (cummingtonite - grunerite); anthophyllite; and actinolite.
Asbestos Abatement	Procedures to control fiber release from asbestos-containing materials in buildings.
Asbestos Control	Minimizing the generation of airborne asbestos fibers until a permanent solution is developed.
Asbestos Exposure Assessment System	A decision tool which can be used to determine the extent of the asbestos hazard that exists in a building, and which can also be used to develop corrective actions.
Asbestos Fibers	Fibers with their length being greater than five microns (length to width ratio of 5:1), generated from an asbestos-containing material.
Asbestosis	A non-malignant, progressive, irreversible lung disease caused by the inhalation of asbestos dust and characterized by diffuse fibrosis.
Chrysotile	The only asbestiform mineral of the serpentine group which contains approximately 40 percent each of silica and magnesium oxide. It is the most common form of asbestos used in buildings.
Dispersion Staining	Used in conjunction with polarized light to identify bulk samples. A particle (fiber) identification technique used based on the difference between light dispersion of a particle (fiber) and a liquid medium in which it is immersed.

ASBESTOS GLOSSARY

Airborne Asbestos	Determination of the amount of asbestos fibers suspended in a given amount of air.
Air Monitoring	The process of measuring the airborne fiber concentration of a specific quantity of air over a given amount of time.
Air Plenum	Any space used to convey air in a building or structure. The space above a suspended ceiling is often used as an air plenum.
Amosite	An asbestiform mineral of the amphibole group containing approximately 50 percent silicon and 40 percent iron oxide, and is made up of straight, brittle fibers, light gray to pale brown in color.
Asbestos	A generic name given to a number of naturally occurring mineral silicates that possess a unique crystalline structure, are in combustible in air, and are separable into fibers. Asbestos includes the asbestiform varieties of chrysotile (serpentine); crocidolite (riebeckite); amosite (cummingtonite - grunerite); anthophyllite; and actinolite.
Asbestos Abatement	Procedures to control fiber release from asbestos-containing materials in buildings.
Asbestos Control	Minimizing the generation of airborne asbestos fibers until a permanent solution is developed.
Asbestos Exposure Assessment System	A decision tool which can be used to determine the extent of the asbestos hazard that exists in a building, and which can also be used to develop corrective actions.
Asbestos Fibers	Fibers with their length being greater than five microns (length to width ratio of 5:1), generated from an asbestos-containing material.
Asbestosis	A non-malignant, progressive, irreversible lung disease caused by the inhalation of asbestos dust and characterized by diffuse fibrosis.
Chrysotile	The only asbestiform mineral of the serpentine group which contains approximately 40 percent each of silica and magnesium oxide. It is the most common form of asbestos used in buildings.
Dispersion Staining	Used in conjunction with polarized light to identify bulk samples. A particle (fiber) identification technique used based on the difference between light dispersion of a particle (fiber) and a liquid medium in which it is immersed.

Appendix B. COMMON ASBESTOS-CONTAINING MATERIALS

COMMON ASBESTOS-CONTAINING MATERIALS

In general, asbestos is commonly found in the following:

- Fireproofing materials added to protect metal beams, decking or supports.
- Sprayed-on or trowel-applied acoustic insulation on ceilings and walls.
- Insulation on hot steam and water pipes.
- Hot-air supply ducts found in forced-air and gravity heaters in homes, smaller apartment buildings and school buildings.
- Boiler insulation in the form of pre-formed blocks, sheets, bricks and mud.
- Insulation on hot-air furnaces and plenums.
- Exhaust ventilation ducts connected to water heaters, small furnaces and laboratory fume hoods.
- Fabric vibration/isolation joints on large heating, ventilation and air conditioning fans.
- Joint or taping compound used to fill cracks in drywall.
- Roofing products such as asphalt asbestos shingles, asbestos cement shingles, roofing felt and patching compounds.
- Mastic for flooring and roofing.
- 9-inch and occasionally, 12-inch square vinyl or asphalt floor tiles.
- Linoleum floor covering.
- Textured paints and plasters.
- Acoustic ceiling tiles.

Reference:

Johnson, J., Surveying and Inspecting Buildings. Asbestos Issues; June 1989.

Appendix C. OCCUPATIONAL HEALTH AND SAFETY ADMINISTRATION (OSHA) ASBESTOS REGULATIONS (29 CFR 1926.58)

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relate to asbestos exposure: the employee's representative level of exposure to asbestos, tremolite, anthophyllite, and actinolite; a description of any personal protective and respiratory equipment used; and information from previous medical examinations of the affected employee that is not otherwise available to the physician. Making this information available to the physician will aid in the evaluation of the employee's health in relation to assigned duties and fitness to wear personal protective equipment, if required.

The employer is required to obtain a written opinion from the examining physician containing the results of the medical examination; the physician's opinion as to whether the employee has any detected medical conditions that would place the employee at an increased risk of exposure-related disease; any recommended limitations on the employee or on the use of personal protective equipment; and a statement that the employee has been informed by the physician of the results of the medical examination and of any medical conditions related to asbestos, tremolite, anthophyllite, and actinolite exposure that require further explanation or treatment. This written opinion must not reveal specific findings or diagnoses unrelated to exposure to asbestos, tremolite, anthophyllite, and actinolite, and a copy of the opinion must be provided to the affected employee.

PART 1926—[AMENDED]

5. An authority citation is added to Subpart D of Part 1926, to read as follows:

Authority: Secs. 4, 6, 8 Occupational Safety and Health Act of 1970, 29 U.S.C. 653, 655, 657; Sec. 107, Contract Work Hours and Safety Standards Act (Construction Safety Act), 40 U.S.C. 333, and Secretary of Labor's Orders 12–71 (36 FR 8754), 8–76 (41 FR 25059), or 9–83 (48 FR 35736), as applicable. Sections 1926.55(c) and 1926.58 also issued under 29 CFR Part 1911.

6. Paragraph (c) of § 1926.55 is hereby revised to read as follows:

§ 1926.55 Gases, vapors, fumes, dusts, and mists.

* * * * *

(c) Paragraphs (a) and (b) of this section do not apply to the exposure of employees to airborne asbestos, tremolite, anthophyllite, or actinolite dust. Whenever any employee is exposed to airborne asbestos, tremolite, anthophyllite, or actinolite dust, the requirements of § 1926.58 of this title shall apply.

7. A new § 1926.58 is added to Subpart D to read as follows:

§ 1926.58 Asbestos, tremolite, anthophyllite, and actinolite.

(a) *Scope and application.* This section applies to all construction work as defined in 29 CFR 1910.12(b), including but not limited to the following:

(1) Demolition or salvage of structures where asbestos, tremolite, anthophyllite, or actinolite is present;

(2) Removal or encapsulation of materials containing asbestos, tremolite, anthophyllite, or actinolite;

(3) Construction, alteration, repair, maintenance, or renovation of structures, substrates, or portions thereof, that contain asbestos, tremolite, anthophyllite, or actinolite;

(4) Installation of products containing asbestos, tremolite, anthophyllite, or actinolite;

(5) Asbestos, tremolite, anthophyllite, and actinolite spill/emergency cleanup; and

(6) Transportation, disposal, storage, or containment of asbestos, tremolite, anthophyllite, or actinolite or products containing asbestos, tremolite, anthophyllite, or actinolite on the site or location at which construction activities are performed.

(b) *Definitions.* "Action level" means an airborne concentration of asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals 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 has been chemically treated and/or altered.

"Assistant Secretary" means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

"Authorized person" means any person authorized by the employer and required by work duties to be present in regulated areas.

"Clean room" means an uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.

"Competent person" means one who is capable of identifying existing asbestos, tremolite, anthophyllite, or actinolite hazards in the workplace and who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f). The duties of the competent person include at least the following: establishing the negative-pressure enclosure, ensuring its integrity, and controlling entry to and exit from the enclosure; supervising any employee exposure monitoring required by the standard; ensuring that all employees working within such an enclosure wear the appropriate personal protective equipment, are trained in the use of appropriate methods of exposure control, and use the hygiene facilities and decontamination procedures specified in the standard; and ensuring that engineering controls in use are in proper operating condition and are functioning properly.

"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 contaminated with asbestos, tremolite, anthophyllite, or actinolite.

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

"Director" means the Director, National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designee.

"Employee exposure" means that exposure to airborne asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals, 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, tremolite, anthophyllite, or actinolite, 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 monodispersed particles of 0.3 micrometers in diameter or larger.

"Regulated area" means an area established by the employer to demarcate areas where airborne concentrations of asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals exceed or can reasonably be expected to exceed the permissible exposure limit. The regulated area may take the form of (1) a temporary enclosure, as required by paragraph (e)(6) of this section, or (2) an area demarcated in any manner that minimizes the number of employees exposed to asbestos, tremolite, anthophyllite, or actinolite.

"Removal" means the taking out or stripping of asbestos, tremolite, anthophyllite, or actinolite or materials containing asbestos, tremolite, anthophyllite, or actinolite.

"Renovation" means the modifying of any existing structure, or portion thereof, where exposure to airborne asbestos, tremolite, anthophyllite, actinolite may result.

"Repair" means overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates where asbestos, tremolite, anthophyllite,or actinolite is present.

"Tremolite, anthophyllite and actinolite" means the non-asbestos form of these minerals, and any of these minerals that have been chemically treated and/or altered.

(c) *Permissible exposure limit (PEL).* The employer shall ensure that no employee is exposed to an airborne concentration of asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals in excess of 0.2 fiber per cubic centimeter of air as an eight (8) hour time-weighted average (TWA), as determined by the method prescribed in Appendix A of this section, or by an equivalent method.

(d) *Communication among employers.* On multi-employer worksites, an employer performing asbestos, tremolite, anthophyllite, or actinolite work requiring the establishment of a regulated area shall inform other employers on the site of the nature of the employer's work with asbestos, tremolite, anthophyllite, or actinolite and of the existence of and requirements pertaining to regulated areas.

(e) *Regulated areas*—(1) *General.* The employer shall establish a regulated area in work areas where airborne concentrations of asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals exceed or can reasonably be expected to exceed the permissible exposure limit prescribed in paragraph (c) of this section.

(2) *Demarcation.* The regulated area shall be demarcated in any manner that minimizes the number of persons within the area and protects persons outside the area from exposure to airborne concentrations of asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals in excess of the permissible exposure limit.

(3) *Access.* Access to regulated areas shall be limited to authorized persons or to persons authorized by the Act or regulations issued pursuant thereto.

(4) *Respirators.* All persons entering a regulated area shall be supplied with a respirator, selected in accordance with paragraph (h)(2) of this section.

(5) *Prohibited activities.* The employer shall ensure that employees do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the regulated area.

(6) *Requirements for asbestos removal, demolition, and renovation operations.* (i) Wherever feasible, the employer shall establish negative-pressure enclosures before commencing removal, demolition, and renovation operations.

(ii) The employer shall designate a competent person to perform or supervise the following duties:

(A) Set up the enclosure;

(B) Ensure the integrity of the enclosure;

(C) Control entry to and exit from the enclosure;

(D) Supervise all employee exposure monitoring required by this section;

(E) Ensure that employees working within the enclosure wear protective clothing and respirators as required by paragraphs (i) and (h) of this section and;

(F) Ensure that employees are trained in the use of engineering controls, work practices, and personal protective equipment;

(G) Ensure that employees use the hygiene facilities and observe the decontamination procedures specified in paragraph (j) of this section; and

(H) Ensure that engineering controls are functioning properly.

(iii) In addition to the qualifications specified in paragraph (b) of this section, the competent person shall be trained in all aspects of asbestos, tremolite, anthophyllite, or actinolite abatement, the contents of this standard, the identification of asbestos, tremolite, anthophyllite, or actinolite and their removal procedures, and other practices for reducing the hazard. Such training shall be obtained in a comprehensive course, such as a course conducted by an EPA Asbestos Training Center, or an equivalent course.

(iv) *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 the requirements of paragraph (e)(6) of this section.

(f) *Exposure monitoring*—(1) *General.* (i) Each employer who has a workplace or work operation covered by this standard shall perform monitoring to determine accurately the airborne concentrations of asbestos, tremolite, anthophyllite, actinolite or a combination of these minerals to which employees may be exposed.

(ii) Determinations of employee exposure shall be made from breathing zone air samples that are representative of the 6-hour TWA of each employee.

(iii) Representative 8-hour TWA employee exposure shall be determined on the basis of one or more samples representing full-shift exposure for employees in each work area.

(2) *Initial monitoring.* (i) Each employer who has a workplace or work operation covered by this standard, except as provided for in paragraphs (f)(2)(ii) and (f)(2)(iii) of this section, shall perform initial monitoring at the initiation of each asbestos, tremolite, anthophyllite, actinolite job to accurately determine the airborne concentrations of asbestos, tremolite, anthophyllite, or actinolite to which employees may be exposed.

(ii) The employer may demonstrate that employee exposures are below the action level by means of objective data demonstrating that the product or material containing asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals cannot release airborne fibers in concentrations exceeding the action level under those work conditions having the greatest potential for releasing asbestos, tremolite, anthophyllite, or actinolite.

(iii) Where the employer has monitored each asbestos, tremolite, anthophyllite, or actinolite job, and the data were obtained during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the employer's current operations, the employer may rely on such earlier monitoring results to satisfy the requirements of paragraph (f)(2)(i) of this section.

(3) *Periodic monitoring within regulated areas.* The employer shall conduct daily monitoring that is representative of the exposure of each employee who is assigned to work within a regulated area. *Exception:* When all employees within a regulated area are equipped with supplied-air respirators operated in the positive-pressure mode, the employer may dispense with the daily monitoring required by this paragraph.

(4) *Termination of monitoring.* If the periodic monitoring required by paragraph (f)(3) of this section reveals that employee exposures, as indicated by statistically reliable measurements, are below the action level, the employer may discontinue monitoring for those employees whose exposures are represented by such monitoring.

(5) *Method of monitoring.* (i) All samples taken to satisfy the monitoring requirements of paragraph (f) of this section shall be personal samples

collected following the porocedures specified in Appendix A.

(ii) All samples taken to satisfy the monitoring requirements of paragraph (f) of this section shall be evaluated using the OSHA Reference Method (ORM) specified in Appendix A, or an equivalent counting method.

(iii) If an equivalent method to the ORM is used, the employer shall ensure that the method meets the following criteria:

(A) Replicate exposure data used to establish equivalency are collected in side-by-side field and laboratory comparisons;

(B) The comparison indicates that 90 percent of the samples collected in the range 0.5 to 2.0 times the permissible limit have an accuracy range of plus or minus 25 percent of the ORM results with a 95 percent confidence level as demonstrated by a statistically valid protocol; and

(C) The equivalent method is documented and the results of the comparison testing are maintained.

(iv) To satisfy the monitoring requirements of paragraph (f), employers shall rely on the results of monitoring analysis performed by laboratories that have instituted quality assurance programs that include the elements prescribed in Appendix A.

(6) *Employee notification of monitoring results.* (i) The employer shall notify effected employees of the monitoring results that represent that employee's exposure as soon as possible following receipt of monitoring results.

(ii) The employer shall notify affected employees of the results of monitoring representing the employee's exposure in writing either individually or by posting at a centrally located place that is accessible to affected employees.

(7) *Observation of monitoring.* (i) The employer shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to asbestos, tremolite, anthophyllite, or actinolite conducted in accordance with this section.

(ii) When observation of the monitoring of employee exposure to asbestos, tremolite, anthophyllite, or actinolite requires entry into an area where the use of protective clothing or equipment is required, the observer shall be provided with and be required to use such clothing and equipment and shall comply with all other applicable safety and health procedures.

(g) *Methods of compliance.*—(1) *Engineering controls and work practices.* (i) The employer shall use one or any combination of the following control methods to achieve compliance with the permissible exposure limit prescribed by paragraph (c) of this section:

(A) Local exhaust ventilation equipped with HEPA filter dust collection systems;

(B) General ventilation systems;

(C) Vacuum cleaners equipped with HEPA filters;

(D) Enclosure or isolation of processes producing asbestos, tremolite, anthophyllite, or actinolite dust;

(E) Use of wet methods, wetting agents, or removal encapsulants to control employee exposures during asbestos, tremolite, anthophyllite, or actinolite handling, mixing, removal, cutting, application, and cleanup;

(F) Prompt disposal of wastes contaminated with asbestos, tremolite, anthophyllite, or actinolite in leak-tight containers; or

(G) Use of work practices or other engineering controls that the Assistant Secretary can show to be feasible.

(ii) Wherever the feasible engineering and work practice controls described above are not sufficient to reduce employee exposure to or below the limit prescribed in paragraph (c), the employer shall use them to reduce employee exposure to the lowest levels attainable by these controls and shall supplement them by the use of respiratory protection that complies with the requirements of paragraph (h) of this section.

(2) *Prohibitions.* (i) High-speed abrasive disc saws that are not equipped with appropriate engineering controls shall not be used for work related to asbestos, tremolite, anthophyllite, or actinolite.

(ii) Compressed air shall not be used to remove asbestos, tremolite, anthophyllite, or actinolite or materials containing asbestos, tremolite, anthophyllite, or actinolite unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air.

(iii) Materials containing asbestos, tremolite, anthophyllite, or actinolite shall not be applied by spray methods.

(3) *Employee rotation.* The employer shall not use employee rotation as a means of compliance with the exposure limit prescribed in paragraph (c) of this section.

(h) *Respiratory protection.*—(1) *General.* The employer shall provide respirators, and ensure that they are used, where required by this section. Respirators shall be used in the following circumstances:

(i) During the interval necessary to install or implement feasible engineering and work practice controls;

(ii) In work operations such as maintenance and repair activities, or other activities for which engineering and work practice controls are not feasible;

(iii) In work situations where feasible engineering and work practice controls are not yet sufficient to reduce exposure to or below the exposure limit; and

(iv) In emergencies.

(2) *Respirator selection.* (i) Where respirators are used, the employer shall select and provide, at no cost to the employee, the appropriate respirator as specified in Table D–4, and shall ensure that the employee uses the respirator provided.

(ii) The employer shall select respirators from among those jointly approved as being acceptable for protection by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part 11.

(iii) The employer shall provide a powered, air-purifying respirator in lieu of any negative-pressure respirator specified in Table D–4 whenever:

(A) An employee chooses to use this type of respirator; and

(B) This respirator will provide adequate protection to the employee.

TABLE D-4.—RESPIRATORY PROTECTION FOR ASBESTOS, TREMOLITE, ANTHOPHYLLITE, AND ACTINOLITE FIBERS

Airborne concentration of asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals	Required respirator
Not in excess of 2 f/cc (10 X PEL).	1. Half-mask air-purifying respirator equipped with high-efficiency filters.
Not in excess of 10 f/cc (50 X PEL).	1. Full facepiece air-purifying respirator equipped with high-efficiency filters.
Not in excess of 20 f/cc (100 X PEL).	1. Any powered air purifying respirator equipped with high efficiency filters. 2. Any supplied-air respirator operated in continuous flow mode.
Not in excess of 200 f/cc (1000 X PEL).	1. Full facepiece supplied-air respirator operated in pressure demand mode.
Greater than 200 f/cc (>1,000 X PEL) or unknown concentration.	1. Full facepiece supplied air respirator operated in pressure demand mode equipped with an auxiliary positive pressure self-contained breathing apparatus.

Note: a. Respirators assigned for higher environmental concentrations may be used at lower concentrations.

b. A high-efficiency filter means a filter that is at least 99.97 percent efficient against mono-dispersed particles of 0.3 micrometers in diameter or larger.

(3) *Respirator program.* (i) Where respiratory protection is used, the employer shall institute a respirator program in accordance with 29 CFR 1910.134(b), (d), (e), and (f).

(ii) The employer shall permit each employee who uses a filter respirator to

change the filter elements whenever an increase in breathing resistance is detected and shall maintain an adequate supply of filter elements for this purpose.

(iii) Employees who wear respirators shall be permitted to leave work areas to wash their faces and respirator facepieces whenever necessary to prevent skin irritation associated with respirator use.

(iv) No employee shall be assigned to tasks requiring the use of respirators if, based on his or her most recent examination, an examining physician determines that the employee will be unable to function normally wearing a respirator, or that the safety or health of the employee or of other employees will be impaired by the use of a respirator. Such employee shall be assigned to another job or given the opportunity to transfer to a different position the duties of which he or she is able to perform with the same employer, in the same geographical area, and with the same seniority, status, and rate of pay he or she had just prior to such transfer, if such a different position is available.

(4) *Respirator fit testing.* (i) The employer shall ensure that the respirator issued to the employee exhibits the least possible facepiece leakage and that the respirator is fitted properly.

(ii) Employers shall perform either quantitative or qualitative face fit tests at the time of initial fitting and at least every 6 months thereafter for each employee wearing a negative-pressure respirator. The qualitative fit tests may be used only for testing the fit of half-mask respirators where they are permited to be worn, and shall be conducted in accordance with Appendix C. The tests shall be used to select facepieces that provide the required protection as prescribed in Table 1.

(i) *Protective clothing*—(1) *General.* The employer shall provide and require the use of protective clothing, such as coveralls or similar whole-body clothing, head coverings, gloves, and foot coverings for any employee exposed to airborne concentrations of asbestos, tremolite, anthophyllite, actinolite or a combination of these minerals that exceed the permissible exposure limit prescribed in paragraph (c) of this section.

(2) *Laundering.* (i) The employer shall ensure that laundering of contaminated clothing is done so as to prevent the release of airborne asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals in excess of the exposure limit prescribed in paragraph (c) of this section.

(ii) Any employer who gives contaminated clothing to another person for laundering shall inform such person of the requirement in paragraph (i)(2)(i) of this section to effectively prevent the release of airborne asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals in excess of the exposure limit prescribed in paragraph (c) of this section.

(3) *Contaminated clothing.* Contaminated clothing shall be transported in sealed impermeable bags, or other closed, impermeable containers, and be labeled in accordance with paragraph (k) of this section.

(4) *Protective clothing for removal, demolition, and renovation operations.* (i) The competent person shall periodically examine worksuits worn by employees for rips or tears that may occur during performance of work.

(ii) When rips or tears are detected while an employee is working within a negative-pressure enclosure, rips and tears shall be immediately mended, or the worksuit shall be immediately replaced.

(j) *Hygiene facilities and practices*—(1) *General.* (i) The employer shall provide clean change areas for employees required to work in regulated areas or required by paragraph (i)(1) of this section to wear protective clothing. *Exception:* In lieu of the change area requirement specified in paragraph (j)(1)(i), the employer may permit employees engaged in small scale, short duration operations, as described in paragraph (e)(6) of this section, to clean their protective clothing with a portable HEPA-equipped vacuum before such employees leave the area where maintenance was performed.

(ii) The employer shall ensure that change areas are equipped with separate storage facilities for protective clothing and street clothing, in accordance with section 1910.141(e).

(iii) Whenever food or beverages are consumed at the worksite and employees are exposed to airborne concentrations of asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals in excess of the permissible exposure limit, the employer shall provide lunch areas in which the airborne concentrations of asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals are below the action level.

(2) *Requirements for removal, demolition, and renovation operations*—(i) *Decontamination area.* Except for small scale, short duration operations, as described in paragraph (e)(6) of this section, the employer shall establish a decontamination area that is adjacent and connected to the regulated area for the decontamination of employees contaminated with asbestos, tremolite, anthophyllite, or actinolite. The decontamination area shall consist of an equipment room, shower area, and clean room in series. The employer shall ensure that employees enter and exit the regulated area through the decontamination area.

(ii) *Clean room.* The clean room shall be equipped with a locker or appropriate storage container for each employee's use.

(iii) *Shower area.* Where feasible, shower facilities shall be provided which comply with 29 CFR 1910.141(d)(3). The showers shall be contiguous both to the equipment room and the clean change room, unless the employer can demonstrate that this location is not feasible. Where the employer can demonstrate that it is not feasible to locate the shower between the equipment room and the clean change room, the employer shall ensure that employees:

(A) Remove asbestos, tremolite, anthophyllite, or actinolite contamination from their worksuits using a HEPA vacuum before proceeding to a shower that is not contiguous to the work area; or

(B) Remove their contaminated worksuits, don clean worksuits, and proceed to a shower that is not contiguous to the work area.

(iv) *Equipment room.* The equipment room shall be supplied with impermeable, labeled bags and containers for the containment and disposal of contaminated protective clothing and equipment.

(v) *Decontamination area entry procedures.* (A) the employer shall ensure that employees:

(*1*) Enter the decontamination area through the clean room;

(*2*) Remove and deposit street clothing within a locker provided for their use; and

(*3*) Put on protective clothing and respiratory protection before leaving the clean room.

(B) Before entering the enclosure, the employer shall ensure that employees pass through the equipment room.

(vi) *Decontamination area exit procedures.* (A) Before leaving the regulated area, the employer shall ensure that employees remove all gross contamination and debris from their protective clothing.

(B) The employer shall ensure that employees remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers.

(C) The employer shall ensure that employees do not remove their respirators in the equipment room.

(D) The employer shall ensure that employees shower prior to entering the clean room.

(E) The employer shall ensure that, after showering, employees enter the clean room before changing into street clothes.

(k) *Communication of hazards to employees*—(1) *Signs.* (i) Warning signs that demarcate the regulated area shall be provided and displayed at each location where airborne concentrations of asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals may be in excess of the exposure limit prescribed in paragraph (c) of this section. Signs shall be posted at such a distance from such a location that an employee may read the signs and take necessary protective steps before entering the area marked by the signs.

(ii) The warning signs required by paragraph (k)(1)(i) of this section shall bear the following information:

DANGER

ASBESTOS

CANCER AND LUNG DISEASE HAZARD

AUTHORIZED PERSONNEL ONLY

RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA

(iii) Where minerals in the regulated area are only tremolite, anthophyllite or actinolite, the employer may replace the term "asbestos" with the appropriate mineral name.

(2) *Labels.* (i) Labels shall be affixed to all products containing asbestos, tremolite, anthophyllite, or actinolite and to all containers containing such products, including waste containers. Where feasible, installed asbestos, tremolite, anthophyllite, or actinolite products shall contain a visible label.

(ii) Labels shall be printed in large, bold letters on a contrasting background.

(iii) Labels shall be used in accordance with the requirements of 29 CFR 1910.1200(f) of OSHA's Hazard Communication standard, and shall contain the folowing information:

DANGER

CONTAINS ASBESTOS FIBERS

AVOID CREATING DUST

CANCER AND LUNG DISEASE HAZARD

(iv) Where minerals to be labeled are only tremolite, anthophyllite and actinolite, the employer may replace the term "asbestos" with the appropriate mineral name.

(v) Labels shall contain a warning statement against breathing airborne asbestos, tremolite, anthophyllite, or actinolite fibers.

(vi) The provisions for labels required by paragraphs (k)(2)(i)–(k)(2)(iv) do not apply where:

(A) asbestos, tremolite, anthophyllite, or actinolite fibers have been modified by a bonding agent, coating, binder, or other material, provided that the manufacturer can demonstrate that, during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos, tremolite, anthophyllite, actinolite, or a combination of these mineral fibers in excess of the action level will be released, or

(B) asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals is present in a product in concentrations less than 0.1 percent by weight.

(3) *Employee information and training.* (i) The employer shall institute a training program for all employees exposed to airborne concentrations of asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals in excess of the action level and shall ensure their participation in the program.

(ii) 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.

(iii) The training program shall be conducted in a manner that the employee is able to understand. The employer shall ensure that each such employee is informed of the following:

(A) Methods of recognizing asbestos, tremolite, anthophyllite, and actinolite;

(B) The health effects associated with asbestos, tremolite, anthophyllite, or actinolite exposure;

(C) The relationship between smoking and asbestos, tremolite, anthophyllite, and actinolite in producing lung cancer;

(D) The nature of operations that could result in exposure to asbestos, tremolite, anthophyllite, and actinolite, 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, tremolite, anthophyllite, or actinolite job; and

(G) Medical surveillance program requirements.

(H) A review of this standard, including appendices.

(4) *Access to training materials.* (i) The employer shall make readily available to all affected employees without cost all written materials relating to the employee training program, including a copy of this regulation.

(ii) The employer shall provide to the Assistant Secretary and the Director, upon request, all information and training materials relating to the employee information and training program.

(l) *Housekeeping*—(1) *Vacuuming.* 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, tremolite, anthophyllite, or actinolite into the workplace.

(2) *Waste disposal.* Asbestos waste, scrap, debris, bags, containers, equipment, and contaminated clothing consigned for disposal shall be collected and disposed of in sealed, labeled, impermeable bags or other closed, labeled, impermeable containers.

(m) *Medical surveillance*—(1) *General*—(i) *Employees covered.* The employer shall institute a medical surveillance program for all employees engaged in work involving levels of asbestos, tremolite, anthophyllite, actinolite or a combination of these minerals, 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.

(ii) *Examination by a physician.* (A) The employer shall ensure that all medical examinations and procedures are performed by or under the supervision of a licensed physician, and are provided at no cost to the employee and at a reasonable time and place.

(B) Persons other than such licensed physicians who administer the pulmonary function testing required by this section shall complete a training course in spirometry sponsored by an appropriate academic or professional institution.

(2) *Medical examinations and consultations*—(i) *Frequency.* The employer shall make available medical examinations and consultations to each employee covered under paragraph

(m)(1)(i) of this section on the following schedules:

(A) Prior to assignment of the employee to an area where negative-pressure respirators are worn;

(B) When the employee is assigned to an area where exposure to asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals may be at or above the action level for 30 or more days per year, a medical examination must be given within 10 working days following the thirtieth day of exposure;

(C) And at least annually thereafter.

(D) If the examining physician determines that any of the examinations should be provided more frequently than specified, the employer shall provide such examinations to affected employees at the frequencies specified by the physician.

(E) *Exception:* No medical examination is required of any employee if adequate records show that the employee has been examined in accordance with this paragraph within the past 1-year period.

(ii) *Content.* Medical examinations made available pursuant to paragraphs (m)(2)(i)(A)–(m)(2)(i)(C) of this section shall include:

(A) A medical and work history with special emphasis directed to the pulmonary, cardiovascular, and gastrointestinal systems.

(B) On initial examination, the standardized questionnaire contained in Appendix D, Part 1, and, on annual examination, the abbreviated standardized questionnaire contained in Appendix D, Part 2.

(C) A physical examination directed to the pulmonary and gastrointestinal systems, including a chest roentgenogram to be administered at the discretion of the physician, and pulmonary function tests of forced vital capacity (FVC) and forced expiratory volume at one second (FEV_1). Interpretation and classification of chest roentgenograms shall be conducted in accordance with Appendix E.

(D) Any other examinations or tests deemed necessary by the examining physician.

(3) *Information provided to the physician.* The employer shall provide the following information to the examining physician:

(i) A copy of this standard and Appendices D, E, and I;

(ii) A description of the affected employee's duties as they relate to the employee's exposure;

(iii) The employee's representative exposure level or anticipated exposure level;

(iv) A description of any personal protective and respiratory equipment used or to be used; and

(v) Information from previous medical examinations of the affected employee that is not otherwise available to the examining physician.

(4) *Physician's written opinion.* (i) The employer shall obtain a written opinion from the examining physician. This written opinion shall contain the results of the medical examination and shall include:

(A) The physician's opinion as to 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, tremolite, anthophyllite, or actinolite;

(B) Any recommended limitations on the employee or on the use of personal protective equipment such as respirators; and

(C) 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, tremolite, anthophyllite, or actinolite exposure.

(ii) 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, tremolite, anthophyllite, or actinolite.

(iii) The employer shall provide a copy of the physician's written opinion to the affected employee within 30 days from its receipt.

(n) *Recordkeeping*—(1) *Objective data for exempted operations.* (i) Where the employer has relied on objective data that demonstrate that products made from or containing asbestos, tremolite, anthophyllite, or actinolite are not capable of releasing fibers of asbestos, tremolite, anthophyllite, or actinolite or a combination of these minerals, in concentrations at or above the action level under the expected conditions of processing, use, or handling to exempt such operations from the initial monitoring requirements under paragraph (f)(2) of this section, the employer shall establish and maintain an accurate record of objective data reasonably relied upon in support of the exemption.

(ii) The record shall include at least the following information:

(A) The product qualifying for exemption;

(B) The source of the objective data;

(C) The testing protocol, results of testing, and/or analysis of the material for the release of asbestos, tremolite, anthophyllite, or actinolite;

(D) A description of the operation exempted and how the data support the exemption; and

(E) Other data relevant to the operations, materials, processing, or employee exposures covered by the exemption.

(iii) The employer shall maintain this record for the duration of the employer's reliance upon such objective data.

(2) *Exposure measurements.* (i) The employer shall keep an accurate record of all measurements taken to monitor employee exposure to asbestos, tremolite, anthophyllite, or actinolite as prescribed in paragraph (f) of this section.

Note: The employer may utilize the services of competent organizations such as industry trade associations and employee associations to maintain the records required by this section.

(ii) This record shall include at least the following information:

(A) The date of measurement;

(B) The operation involving exposure to asbestos, tremolite, anthophyllite, or actinolite that is being monitored;

(C) Sampling and analytical methods used and evidence of their accuracy;

(D) Number, duration, and results of samples taken;

(E) Type of protective devices worn, if any; and

(F) Name, social security number, and exposure of the employees whose exposures are represented.

(iii) The employer shall maintain this record for at least thirty (30) years, in accordance with 29 CFR 1910.20.

(3) *Medical surveillance.* (i) The employer shall establish and maintain an accurate record for each employee subject to medical surveillance by paragraph (m) of this section, in accordance with 29 CFR 1910.20.

(ii) The record shall include at least the following information:

(A) The name and social security number of the employee;

(B) A copy of the employee's medical examination results, including the medical history, questionnaire responses, results of any tests, and physician's recommendations.

(C) Physician's written opinions;

(D) Any employee medical complaints related to exposure to asbestos, tremolite, anthophyllite, or actinolite; and

(E) A copy of the information provided to the physician as required by paragraph (m) of this section.

(iii) The employer shall ensure that this record is maintained for the duration of employment plus thirty (30) years, in accordance with 29 CFR 1910.20.

(4) *Training records.* The employer shall maintain all employee training records for one 1 year beyond the last date of employment by that employer.

(5) *Availability.* (i) The employer, upon written request, shall make all records required to be maintained by this section available to the Assistant Secretary and the Director for examination and copying.

(ii) The employer, upon request, shall make any exposure records required by paragraphs (f) and (n) of this section available for examination and copying to affected employees, former employees, designated representatives, and the Assistant Secretary, in accordance with 29 CFR 1910.20(a)–(e) and (g)–(i).

(iii) The employer, upon request, shall make employee medical records required by paragraphs (m) and (n) of this section available for examination and copying to the subject employee, anyone having the specific written consent of the subject employee, and the Assistant Secretary, in accordance with 29 CFR 1910.20.

(6) *Transfer of records.* (i) The employer shall comply with the requirements concerning transfer of records set forth in 29 CFR 1910.20 (h).

(ii) Whenever the employer ceases to do business and there is no successor employer to receive and retain the records for the prescribed period, the employer shall notify the Director at least 90 days prior to disposal and, upon request, transmit them to the Director.

(o) *Dates*—(1) *Effective date.* This section shall become effective [insert date 30 days from publication in the Federal Register]. The requirements of the asbestos standard issued in June 1972 (37 FR 11318), as amended, and published in 29 CFR 1910.1001 (1985) remain in effect until compliance is achieved with the parallel provisions of this standard.

(2) *Start-up dates.* (i) The requirements of paragraphs (c) through (n) of this section, including the engineering controls specified in paragraph (g)(1) of this section, shall be complied with by [insert date 210 days from publication in the Federal Register].

(p) *Appendices.* (1) Appendices A, C, D, and E to this section are incorporated as part of this section and the contents of these appendices are mandatory.

(2) Appendices B, F, G, H, and I to this section are informational and are not intended to create any additional obligations not otherwise imposed or to detract from any existing obligations.

Appendix A to § 1926.58—OSHA Reference Method—Mandatory

This mandatory appendix specifies the procedure for analyzing air samples for asbestos, tremolite, anthophyllite, and actinolite and specifies quality control procedures that must be implemented by laboratories performing the analysis. The sampling and analytical methods described below represent the elements of the available monitoring methods (such as the NIOSH 7400 method) which OSHA considers to be essential to achieve adequate employee exposure monitoring while allowing employers to use methods that are already established within their organizations. All employers who are required to conduct air monitoring under paragraph (f) of the standard are required to utilize analytical laboratories that use this procedure, or an equivalent method, for collecting and analyzing samples.

Sampling and Analytical Procedure

1. The sampling medium for air samples shall be mixed cellulose ester filter membranes. These shall be designated by the manufacturer as suitable for asbestos, tremolite, anthophyllite, and actinolite counting. See below for rejection of blanks.

2. The preferred collection device shall be the 25-mm diameter cassette with an open-faced 50-mm extension cowl. The 37-mm cassette may be used if necessary but only if written justification for the need to use the 37-mm filter cassette accompanies the sample results in the employee's exposure monitoring record.

3. An air flow rate between 0.5 liter/min and 2.5 liters/min shall be selected for the 25/mm cassette. If the 37-mm cassette is used, an air flow rate between 1 liter/min and 2.5 liters/min shall be selected.

4. Where possible, a sufficient air volume for each air sample shall be collected to yield between 100 and 1,300 fibers per square millimeter on the membrane filter. If a filter darkens in appearance or if loose dust is seen on the filter, a second sample shall be started.

5. Ship the samples in a rigid container with sufficient packing material to prevent dislodging the collected fibers. Packing material that has a high electrostatic charge on its surface (e.g., expanded polystyrene) cannot be used because such material can cause loss of fibers to the sides of the cassette.

6. Calibrate each personal sampling pump before and after use with a representative filter cassette installed between the pump and the calibration devices.

7. Personal samples shall be taken in the "breathing zone" of the employee (i.e., attached to or near the collar or lapel near the worker's face).

8. Fiber counts shall be made by positive phase contrast using a microscope with an 8 to 10 X eyepiece and a 40 to 45 X objective for a total magnification of approximately 400 X and a numerical aperture of 0.65 to 0.75. The microscope shall also be fitted with a green or blue filter.

9. The microscope shall be fitted with a Walton-Beckett eyepiece graticule calibrated for a field diameter of 100 micrometers (+/−2 micrometers).

10. The phase-shift detection limit of the microscope shall be about 3 degrees measured using the HSE phase shift test slide as outlined below.

a. Place the test slide on the microscope stage and center it under the phase objective.

b. Bring the blocks of grooved lines into focus.

Note.—The slide consists of seven sets of grooved lines (ca. 20 grooves to each block) in descending order of visibility from sets 1 to 7, seven being the least visible. The requirements for asbestos, tremolite, anthophyllite, and actinolite counting are that the microscope optics must resolve the groooved lines in set 3 completely, although they may appear somewhat faint, and that the grooved lines in sets 6 and 7 must be invisible. Sets 4 and 5 must be at least partially visible but may vary slightly in visibility between microscopes. A microscope that fails to meet these requirements has either too low or too high a resolution to be used for asbestos, tremolite, anthophyllite, and actinolite counting.

c. If the image deteriorates, clean and adjust the microscope optics. If the problem persists, consult the microscope manufacturer.

11. Each set of samples taken will include 10 percent blanks or a minimum of 2 blanks. The blank results shall be averaged and subtracted from the analytical results before reporting. Any samples represented by a blank having a fiber count in excess of 7 fibers/100 fields shall be rejected.

12. The samples shall be mounted by the acetone/triacetin method or a method with an equivalent index of refraction and similar clarity.

13. Observe the following counting rules.

a. Count only fibers equal to or longer than 5 micrometers. Measure the length of curved fibers along the curve.

b. Count all particles as asbestos, tremolite, anthophyllite, and actinolite that have a length-to-width ratio (aspect ratio) of 3:1 or greater.

c. Fibers lying entirely within the boundary of the Walton-Beckett graticule field shall receive a count of 1. Fibers crossing the boundary once, having one end within the circle, shall receive the count of one half (½). Do not count any fiber that crosses the graticule boundary more than once. Reject and do not count any other fibers even though they may be visible outside the graticule area.

d. Count bundles of fibers as one fiber unless individual fibers can be identified by observing both ends of an individual fiber.

e. Count enough graticule fields to yield 100 fibers. Count a minimum of 20 fields; stop counting at 100 fields regardless of fiber count.

14. Blind recounts shall be conducted at the rate of 10 percent.

Quality Control Procedures

1. Intralaboratory program. Each laboratory and/or each company with more than one microscopist counting slides shall establish a statistically designed quality assurance program involving blind recounts and

comparisons between microscopists to monitor the variability of counting by each microscopist and between microscopists. In a company with more than one laboratory, the program shall include all laboratories, and shall also evaluate the laboratory-to-laboratory variability.

2. Interlaboratory program. Each laboratory analyzing asbestos, tremolite, anthophyllite, and actinolite samples for compliance determination shall implement an interlaboratory quality assurance program that as a minimum includes participation of at least two other independent laboratories. Each laboratory shall participate in round robin testing at least once every 6 months with at least all the other laboratories in its interlaboratory quality assurance group. Each laboratory shall submit slides typical of its own workload for use in this program. The round robin shall be designed and results analyzed using appropriate statistical methodology.

3. All individuals performing asbestos, tremolite, anthophyllite, and actinolite analysis must have taken the NIOSH course for sampling and evaluating airborne asbestos, tremolite, anthophyllite, and actinolite dust or an equivalent course.

4. When the use of different microscopes contributes to differences between counters and laboratories, the effect of the different microscope shall be evaluated and the microscope shall be replaced, as necessary.

5. Current results of these quality assurance programs shall be posted in each laboratory to keep the microscopists informed.

Appendix B to § 1926.58—Detailed Procedure for Asbestos Tremolite, Anthophyllite, and Actinolite Sampling and Analysis—Non-Mandatory

This appendix contains a detailed procedure for sampling and analysis and includes those critical elements specified in Appendix A. Employers are not required to use this procedure, but they are required to use Appendix A. The purpose of Appendix B is to provide a detailed step-by-step sampling and analysis procedure that conforms to the elements specified in Appendix A. Since this procedure may also standardize the analysis and reduce variability, OSHA encourages employers to use this appendix.

Asbestos, Tremolite, Anthophyllite, and Actinolite Sampling and Analysis Method

Technique: Microscopy, Phase Contrast.

Analyte: Fibers (Manual count).

Sample Preparation: Acetone/triacetin method.

Calibration: Phase-shift detection limit about 3 degrees.

Range: 100 to 1300 fibers/mm² filter area.

Estimated Limit of Detection: 7 fibers/mm² filter area.

Sampler: Filter (0.8–1.2 um mixed cellulose ester membrane, 25-mm diameter).

Flow Rate: 0.5 l/min to 2.5 l/min (25-mm cassette); 1.0 l/min to 2.5 l/min (37-mm cassette).

Sample Volume: Adjust to obtain 100 to 1300 fibers/mm².

Shipment: Routine.

Sample Stability: Indefinite.

Blanks: 10% of samples (minimum 2).

Standard Analytical Error: 0.25.

Applicability: The working range is 0.02 f/cc (1920-L air sample) to 1.25 f/cc (400-L air sample). The method gives an index of airborne asbestos, tremolite, anthophyllite, and actinolite fibers but may be used for other materials such as fibrous glass by inserting suitable parameters into the counting rules. The method does not differentiate between asbestos, tremolite, anthophyllite, and actinolite and other fibers. Asbestos, tremolite, anthophyllite, and actinolite fibers less than ca. 0.25 um diameter will not be detected by this method.

Interferences: Any other airborne fiber may interfere since all particles meeting the counting criteria are counted. Chain-like particles may appear fibrous. High levels of nonfibrous dust particles may obscure fibers in the field of view and raise the detection limit.

Reagents

1. Acetone.

2. Triacetin (glycerol triacetate), reagent grade.

Special Precautions

Acetone is an extremely flammable liquid and precautions must be taken not to ignite it. Heating of acetone must be done in a ventilated laboratory fume hood using a flameless, spark-free heat source.

Equipment

1. Collection device: 25-mm cassette with 50-mm extension cowl with cellulose ester filter, 0.8 to 1.2 mm pore size and backup pad.

Note.—Analyze representative filters for fiber background before use and discard the filter lot if more than 5 fibers/100 fields are found.

2. Personal sampling pump, greater than or equal to 0.5 L/min, with flexible connecting tubing.

3. Microscope, phase contrast, with green or blue filter, 8 to 10X eyepiece, and 40 to 45X phase objective (total magnification ca 400X); numerical aperture = 0.65 to 0.75.

4. Slides, glass, single-frosted, pre-cleaned, 25 × 75 mm.

5. Cover slips, 25 × 25 mm, no. 1½ unless otherwise specified by microscope manufacturer.

6. Knife, #1 surgical steel, curved blade.

7. Tweezers.

8. Flask, Guth-type, insulated neck, 250 to 500 mL (with single-holed rubber stopper and elbow-jointed glass tubing, 18 to 22 cm long).

9. Hotplate, spark-free, stirring type; heating mantle; or infrared lamp and magnetic stirrer.

10. Syringe, hypodermic, with 22-gauge needle.

11. Graticule, Walton-Beckett type with 100 um diameter circular field at the specimen plane (area = 0.00785 mm²), (Type G-22).

Note.—The graticule is custom-made for each microscope.

12. HSE/NPL phase contrast test slide, Mark II.

13. Telescope, ocular phase-ring centering.

14. Stage micrometer (0.01 mm divisions).

Sampling

1. Calibrate each personal sampling pump with a representative sampler in line.

2. Fasten the sampler to the worker's lapel as close as possible to the worker's mouth. Remove the top cover from the end of the cowl extension (open face) and orient face down. Wrap the joint between the extender and the monitor's body with shrink tape to prevent air leaks.

3. Submit at least two blanks (or 10% of the total samples, whichever is greater) for each set of samples. Remove the caps from the field blank cassettes and store the caps and cassettes in a clean area (bag or box) during the sampling period. Replace the caps in the cassettes when sampling is completed.

4. Sample at 0.5 L/min or greater. Do not exceed 1 mg total dust loading on the filter. Adjust sampling flow rate, Q (L/min), and time to produce a fiber density, E (fibers/mm²), of 100 to 1300 fibers/mm² [3.85 × 10⁴ to 5 × 10⁵ fibers per 25-mm filter with effective collection area (A_c = 385 mm²)] for optimum counting precision (see step 21 below). Calculate the minimum sampling time, $t_{minimum}$ (min) at the action level (one-half of the current standard), L (f/cc) of the fibrous aerosol being sampled:

$$t_{min} = \frac{(Ac)(E)}{(Q)(L)10^3}$$

5. Remove the field monitor at the end of sampling, replace the plastic top cover and small end caps, and store the monitor.

6. Ship the samples in a rigid container with sufficient packing material to prevent jostling or damage. NOTE: Do not use polystyrene foam in the shipping container because of electrostatic forces which may cause fiber loss from the sampler filter.

Sample Preparation

Note.—The object is to produce samples with a smooth (non-grainy) background in a medium with a refractive index equal to or less than 1.46. The method below collapses the filter for easier focusing and produces permanent mounts which are useful for quality control and interlaboratory comparison. Other mounting techniques meeting the above criteria may also be used, e.g., the nonpermanent field mounting technique used in P & CAM 239.

7. Ensure that the glass slides and cover slips are free of dust and fibers.

8. Place 40 to 60 ml of acetone into a Guth-type flask. Stopper the flask with a single-hole rubber stopper through which a glass tube extends 5 to 8 cm into the flask. The portion of the glass tube that exits the top of the stopper (8 to 10 cm) is bent downward in an elbow that makes an angle of 20 to 30 degrees with the horizontal.

9. Place the flask in a stirring hotplate or wrap in a heating mantle. Heat the acetone gradually to its boiling temperature (ca. 58°C).

Caution.—The acetone vapor must be generated in a ventilated fume hood away from all open flames and spark sources. Alternate heating methods can be used, providing no open flame or sparks are present.

10. Mount either the whole sample filter or a wedge cut from the sample filter on a clean glass slide.

a. Cut wedges of ca. 25 percent of the filter area with a curved-blade steel surgical knife using a rocking motion to prevent tearing.

b. Place the filter or wedge, dust side up, on the slide. Static electricity will usually keep the filter on the slide until it is cleared.

c. Hold the glass slide supporting the filter approximately 1 to 2 cm from the glass tube port where the acetone vapor is escaping from the heated flask. The acetone vapor stream should cause a condensation spot on the glass slide ca. 2 to 3 cm in diameter. Move the glass slide gently in the vapor stream. The filter should clear in 2 to 5 sec. If the filter curls, distorts, or is otherwise rendered unusable, the vapor stream is probably not strong enough. Periodically wipe the outlet port with tissue to prevent liquid acetone dripping onto the filter.

d. Using the hypodermic syringe with a 22-gauge needle, place 1 to 2 drops of triacetin on the filter. Gently lower a clean 25-mm square cover slip down onto the filter at a slight angle to reduce the possibility of forming bubbles. If too many bubbles form or the amount of triacetin in unsufficient, the cover slip may become detached within a few hours.

e. Glue the edges of the cover slip to the glass slide using a lacquer or nail polish.

Note.—If clearing is slow, the slide preparation may be heated on a hotplate (surface temperature 50°C) for 15 min to hasten clearing. Counting may proceed immediately after clearing and mounting are completed.

Calibration and Quality Control

11. Calibration of the Walton-Beckett graticule. The diameter, d_c (mm), of the circular counting area and the disc diameter must be specified when ordering the graticule.

a. Insert any available graticule into the eyepiece and focus so that the graticule lines are sharp and clear.

b. Set the appropriate interpupillary distance and, if applicable, reset the binocular head adjustment so that the magnification remains constant.

c. Install the 40 to 45 X phase objective.

d. Place a stage micrometer on the microscope object stage and focus the microscope on the graduated lines.

e. Measure the magnified grid length, L_e (um), using the stage micrometer.

f. Remove the graticule from the microscope and measure its actual grid length, L_a (mm). This can best be accomplished by using a stage fitted with verniers.

g. Calculate the circle diameter, d_c (mm), for the Walton-Beckett graticule:

$$d_c = \frac{L_a \times D}{L_e}$$

Example: If $L_e = 108$ um, $L_a = 2.93$ mm and $D = 100$ um, then $d_c = 2.71$ mm.

h. Check the field diameter. D (acceptable range 100 mm ± 2 mm) with a stage micrometer upon receipt of the graticule from the manufacturer. Determine field area (mm²).

12. Microscope adjustments. Follow the manufacturer's instructions and also the following:

a. Adjust the light source for even illumination across the field of view at the condenser iris.

Note.—Kohler illumination is preferred, where available.

b. Focus on the particulate material to be examined.

c. Make sure that the field iris is in focus, centered on the sample, and open only enough to fully illuminate the field of view.

d. Use the telescope ocular supplied by the manufacturer to ensure that the phase rings (annular diaphragm and phase-shifting elements) are concentric.

13. Check the phase-shift detection limit of the microscope periodically.

a. Remove the HSE/NPL phase-contrast test slide from its shipping container and center it under the phase objective.

b. Bring the blocks of grooved lines into focus.

Note.—The slide consists of seven sets of grooves (ca. 20 grooves to each block) in descending order of visibility from sets 1 to 7. The requirements for counting are that the microscope optics must resolve the grooved lines in set 3 completely, although they may appear somewhat faint, and that the grooved lines in sets 6 to 7 must be invisible. Sets 4 and 5 must be at least partially visible but may vary slightly in visibility between microscopes. A microscope which fails to meet these requirements has either too low or too high a resolution to be used for asbestos, tremolite, anthophyllite, and actinolite counting.

c. If the image quality deteriorates, clean the microscope optics and, if the problem persists, consult the microscope manufacturer.

14. Quality control of fiber counts.

a. Prepare and count field blanks along with the field samples. Report the counts on each blank. Calculate the mean of the field blank counts and subtract this value from each sample count before reporting the results.

Note 1.—The identity of the blank filters should be unknown to the counter until all counts have been completed.

Note 2.—If a field blank yields fiber counts greater than 7 fibers/100 fields, report possible contamination of the samples.

b. Perform blind recounts by the same counter on 10 percent of filters counted (slides relabeled by a person other than the counter).

15. Use the following test to determine whether a pair of counts on the same filter should be rejected because of possible bias. This statistic estimates the counting repeatability at the 95% confidence level. Discard the sample if the difference between the two counts exceeds 2.77 $(F)S_r$, where F = average of the two fiber counts and S_r = relative standard deviation, which should be derived by each laboratory based on historical in-house data.

Note.—If a pair of counts is rejected as a result of this test, recount the remaining samples in the set and test the new counts against the first counts. Discard all rejected paired counts.

16. Enroll each new counter in a training course that compares performance of counters on a variety of samples using this procedure.

Note.—To ensure good reproducibility, all laboratories engaged in asbestos, tremolite, anthophyllite, and actinolite counting are required to participate in the Proficiency Analytical Testing (PAT) Program and should routinely participate with other asbestos, tremolite, anthophyllite, and actinolite fiber counting laboratories in the exchange of field samples to compare performance of counters.

Measurement

17. Place the slide on the mechanical stage of the calibrated microscope with the center of the filter under the objective lens. Focus the microscope on the plane of the filter.

18. Regularly check phase-ring alignment and Kohler illumination.

19. The following are the counting rules:

a. Count only fibers longer than 5 um. Measure the length of curved fibers along the curve.

b. Count only fibers with a length-to-width ratio equal to or greater than 3:1.

c. For fibers that cross the boundary of the graticule field, do the following:

1. Count any fiber longer than 5 um that lies entirely within the graticule area.

2. Count as ½ fiber any fiber with only one end lying within the graticule area.

3. Do not count any fiber that crosses the graticule boundary more than once.

4. Reject and do not count all other fibers.

d. Count bundles of fibers as one fiber unless individual fibers can be identified by observing both ends of a fiber.

e. Count enough graticule fields to yield 100 fibers. Count a minimum of 20 fields. Stop at 100 fields regardless of fiber count.

20. Start counting from one end of the filter and progress along a radial line to the other end, shift either up or down on the filter, and continue in the reverse direction. Select fields randomly by looking away from the eyepiece briefly while advancing the mechanical stage. When an agglomerate covers ca. ¼ or more of the field of view, reject the field and select another. Do not report rejected fields in the number of total fields counted.

Note.—When counting a field, continuously scan a range of focal planes by moving the fine focus knob to detect very fine fibers which have become embedded in the filter. The small-diameter fibers will be very faint but are an important contribution to the total count.

Calculations

21. Calculate and report fiber density on the filter, E (fibers/mm²) by dividing the total fiber count, F, minus the mean field blank count, B, by the number of fields, n; and the field area, A_f (0.00785 mm² for a properly calibrated Walton-Beckett graticule):

$$E = \frac{F-B}{(n)(A_f)} \text{ fibers/mm}^2$$

22. Calculate the concentration, C (f/cc), of fibers in the air volume sampled, V (L), using the effective collection area of the filter, A_c (385 mm² for a 25-mm filter):

$$C = \frac{(E)(Ac)}{V(10^3)}$$

Note.—Periodically check and adjust the value of A_f if necessary.

Appendix C to § 1323.58—Qualitative and Quantitative Fit Testing Procedures—Mandatory

Qualitative Fit Test Protocols

I. Isoamyl Acetate Protocol

A. Odor threshold screening.

1. Three 1-liter glass jars with metal lids (e.g. Mason or Bell jars) are required.

2. Odor-free water (e.g. distilled or spring water) at approximately 25 °C shall be used for the solutions.

3. The isoamyl acetate (IAA) (also known as isopentyl acetate) stock solution is prepared by adding 1 cc of pure IAA to 800 cc of odor free water in a 1-liter jar and shaking for 30 seconds. This solution shall be prepared new at least weekly.

4. The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well ventilated but shall not be connected to the same recirculating ventilation system.

5. The odor test solution is prepared in a second jar by placing 0.4 cc of the stock solution into 500 cc of odor free water using a clean dropper or pipette. Shake for 30 seconds and allow to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution may be used for only one day.

6. A test blank is prepared in a third jar by adding 500 cc of odor free water.

7. The odor test and test blank jars shall be labelled 1 and 2 for jar identification. If the labels are put on the lids they can be periodically peeled, dried off and switched to maintain the integrity of the test.

8. The following instructions shall be typed on a card and placed on the table in front of the two test jars (i.e. 1 and 2): "The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate to the test conductor which bottle contains banana oil."

9. The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

10. If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit test may not be used.

11. If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to respirator selection and fit testing.

B. Respirator Selection.

1. The test subject shall be allowed to pick the most comfortable respirator from a selection including respirators of various sizes from different manufacturers. The selection shall include at least five sizes of elastomeric half facepieces, from at least two manufacturers.

2. The selection process shall be conducted in a room separate from the fit-test chamber to prevent odor fatigue. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine a "comfortable" respirator. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, as it is only a review.

3. The test subject should understand that the employee is being asked to select the respirator which provides the most comfortable fit. Each respirator represents a different size and shape and, if fit properly and used properly will provide adequate protection.

4. The test subject holds each facepiece up to the face and eliminates those which obviously do not give a comfortable fit. Normally, selection will begin with a half-mask and if a good fit cannot be found, the subject will be asked to test the full facepiece respirators. (A small percentage of users will not be able to wear any half-mask.)

5. The more comfortable facepieces are noted; the most comfortable mask is donned and *worn at least five minutes* to assess comfort. All donning and adjustments of the facepiece shall be performed by the test subject without assistance from the test conductor or other person. Assistance in assessing comfort can be given by discussing the points in #6 below. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.

6. Assessment of comfort shall include reviewing the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:

- Positioning of mask on nose.
- Room for eye protection.
- Room to talk.
- Positioning mask on face and cheeks.

7. The following criteria shall be used to help determine the adequacy of the respirator fit:

- Chin properly placed.
- Strap tension.
- Fit across nose bridge.
- Distance from nose to chin.
- Tendency to slip.
- Self-observation in mirror.

8. The test subject shall conduct the conventional negative and positive-pressure fit checks before conducting the negative- or positive-pressure test the subject shall be told to "seat" the mask by rapidly moving the head from side-to-side and up and down, while taking a few deep breaths.

9. The test subject is now ready for fit testing.

10. After passing the fit test, the test subject shall be questioned again regarding the comfort of the respirator. If it has become uncomfortable, another model of respirator shall be tried.

11. The employee shall be given the opportunity to select a different facepiece and be retested if the chosen facepiece becomes increasingly uncomfortable at any time.

C. Fit test:

1. The fit test chamber shall be similar to a clear 55 gal drum liner suspended inverted over a 2 foot diameter frame, so that the top of the chamber is about 6 inches above the test subject's head. The inside top center of the chamber shall have a small hook attached.

2. Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors. The cartridges or masks shall be changed at least weekly.

3. After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.

4. A copy of the following test exercises and rainbow passage shall be taped to the inside of the test chamber:

Test Exercises

i. Breathe normally.

ii. Breathe deeply. Be certain breaths are *deep* and *regular*.

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

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

v. Talking. Talk aloud and slowly for several minutes. The following paragraph is called the Rainbow Passage. Reading it will result in a wide range of facial movements, and thus be useful to satisfy this requirement.

Alternative passages which serve the same purpose may also be used.

vi. Jogging in place.

vii. Breathe normally.

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.

5. Each test subject shall wear the respirator for at least 10 minutes before starting the fit test.

6. Upon entering the test chamber, the test subject shall be given a 6 inch by 5 inch piece of paper towel or other porous absorbent single ply material, folded in half and wetted with three-quarters of one cc of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber.

7. Allow two minutes for the IAA test concentration to be reached before starting the fit-test exercises. This would be an appropriate time to talk with the test subject to explain the fit test, the importance of cooperation, the purpose for the head exercises, or to demonstrate some of the exercises.

8. Each exercise described in #4 above shall be performed for at least one minute.

9. If at any time during the test, the subject detects the banana-like odor of IAA, the test has failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

10. If the test is failed, the subject shall return to the selection room and remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber, and again begin the procedure described in the c(4) through c(8) above. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject shall wait about 5 minutes before retesting. Odor sensitivity will usually have returned by this time.

11. If a person cannot pass the fit test described above wearing a half-mask respirator from the aveilable selection, full facepiece models must be used.

12. When a respirator is found that passes the test, the subject breaks the facereal and takes a breath before exiting the chamber. This is to assure that the reason the test subject is not smelling the IAA is the good fit of the respirator facepiece seal and not olfactory fatigue.

13. When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test. To keep the area from becoming contaminated, the used towels shall be kept in a self-sealing bag so there is no significant IAA concentration buildup in the test chamber during subsequent tests.

14. At least two facepieces shall be selected for the IAA test protocol. The test subject shall be given the opportunity to wear them for one week to choose the one which is more comfortable to wear.

15. Persons who have successfully passed this fit test with a half-mask respirator may be assigned the use of the test respirator in atmospheres with up to 10 times the PEL of airborne asbestos. In atmospheres greater than 10 times, and less than 100 times the PEL (up to 100 ppm), the subject must pass the IAA test using a full face negative pressure respirator. (The concentration of the IAA inside the test chamber must be increased by ten times for QLFT of the full facepiece.)

16. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface.

17. If hair growth or apparel interfere with a satisfactory fit, then they shall be altered or removed so as to eliminate interference and allow a satisfactory fit. If a satisfactory fit is still not attained, the test subject must use a positive-pressure respirator such as powered air-purifying respirators, supplied air respirator, or self-contained breathing apparatus.

18. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician trained in respirator diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

19. Qualitative fit testing shall be repeated at least every six months.

20. In addition, because the sealing of the respirator may be affected, qualitative fit testing shall be repeated immediately when the test subject has a:

(1) Weight change of 20 pounds or more.

(2) Significant facial scarring in the area of the facepiece seal.

(3) Significant dental changes; i.e.: multiple extractions without prothesis, or acquiring dentures.

(4) Reconstructive or cosmetic surgery, or

(5) Any other condition that may interfere with facepiece sealing.

D. Recordkeeping.

A summary of all test results shall be maintained in each office for 3 years. The summary shall include:

(1) Name of test subject.

(2) Date of testing.

(3) Name of the test conductor.

(4) Respirators selected (indicate manufacturer, model, size and approval number).

(5) Testing agent.

II. Saccharin Solution Aerosol Protocol

A. Respirator Selection.

Respirators shall be selected as described in section IB (respirator selection) above, except that each respirator shall be equipped with a particulate filter.

B. Taste Threshold Screening.

1. An enclosure about head and shoulders shall be used for threshold screening (to determine if the individual can taste saccharin) and for fit testing. The enclosure shall be approximately 12 inches in diameter by 14 inches tall with at least the front clear to allow free movement of the head when a respirator is worn.

2. The test enclosure shall have a three-quarter inch hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

3. The entire screening and testing procedure shall be explained to the test subject prior to conducting the screening test.

4. During the threshold screening test, the test subject shall don the test enclosure and breathe with open mouth with tongue extended.

5. Using a DeVilbiss Model 40 Inhalation Medication Nebulizer or equivalent, the test conductor shall spray the threshold check solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

6. The threshold check solution consists of 0.83 grams of sodium saccharin, USP in water. It can be prepared by putting 1 cc of the test solution (see C 7 below) in 100 cc of water.

7. To produce the aerosol, the nebulizer bulb is firmly squeezed so that it collapses completely, then is released and allowed to fully expand.

8. Ten squeezes of the nebulizer bulb are repeated rapidly and then the test subject is asked whether the saccharin can be tasted.

9. If the first response is negative, ten more squeezes of the nebulizer bulb are repeated rapidly and the test subject is again asked whether the saccharin can be tasted.

10. If the second response is negative ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin can be tasted.

11. The test conductor will take note of the number of squeezes required to elicit a taste response.

12. If the saccharin is not tasted after 30 squeezes (Step 10), the saccharin fit test cannot be performed on the test subject.

13. If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit test.

14. Correct use of the nebulizer means that approximately 1 cc of liquid is used at a time in the nebulizer body.

15. The nebulizer shall be thoroughly rinsed in water, shaken dry, and refilled at least every four hours.

C. Fit test.

1. The test subject shall don and adjust the respirator without the assistance from any person.

2. The fit test uses the same enclosure described in IIB above.

3. Each test subject shall wear the respirator for at least 10 minutes before starting the fit test.

4. The test subject shall don the enclosure while wearing the respirator selected in section IB above. This respirator shall be properly adjusted and equipped with a particulate filter.

5. The test subject may not eat, drink (except plain water), or chew gum for 15 minutes before the test.

6. A second DeVilbiss Model 40 Inhalation Medication Nebulizer is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

7. The fit test solution is prepared by adding 83 grams of sodium saccharin to 100 cc of warm water.

8. As before, the test subject shall breathe with mouth open and tongue extended.

9. The nebulizer is inserted into the hole in the front of the enclosure and the fit test solution is sprayed into the enclosure using the same technique as for the taste threshold screening and the same number of squeezes required to elicit a taste response in the screening. (See B8 through B10 above.)

10. After generation of the aerosol read the following instructions to the test subject. The test subject shall perform the exercises for one minute each.

i. Breathe normally.

ii. Breathe deeply. Be certain breaths are *deep* and *regular*.

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

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

v. Talking. Talk aloud and slowly for several minutes. The following paragraph is called the Rainbow Passage. Reading it will result in a wide range of facial movements, and thus be useful to satisfy this requirement. Alternative passages which serve the same purpose may also be used.

vi. Jogging in place.

vii. Breathe normally.

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 his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

11. At the beginning of each exercise, the aerosol concentration shall be replenished using one-half the number of squeezes as initially described in C9.

12. The test subject shall indicate to the test conductor if at any time during the fit test the taste of saccharin is detected.

13. If the saccharin is detected the fit is deemed unsatisfactory and a different respirator shall be tried.

14. At least two facepieces shall be selected by the IAA test protocol. The test subject shall be given the opportunity to wear them for one week to choose the one which is more comfortable to wear.

15. Successful completion of the test protocol shall allow the use of the half mask tested respirator in contaminated atmospheres up to 10 times the PEL of asbestos. In other words this protocol may be used to assign protection factors no higher than ten.

16. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface.

17. If hair growth or apparel interfere with a satisfactory fit, then they shall be altered or removed so as to eliminate interference and allow a satisfactory fit. If a satisfactory fit is still not attained, the test subject must use a positive-pressure respirator such as powered air-purifying respirators, supplied air respirator, or self-contained breathing apparatus.

18. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician trained in respirator diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

19. Qualitative fit testing shall be repeated at least every six months.

20. In addition, because the sealing of the respirator may be affected, qualitative fit testing shall be repeated immediately when the test subject has a:

(1) Weight change of 20 pounds or more,

(2) Significant facial scarring in the area of the facepiece seal,

(3) Significant dental changes; i.e., multiple extractions without prothesis, or acquiring dentures,

(4) Reconstructive or cosmetic surgery, or

(5) Any other condition that may interfere with facepiece sealing.

D. Recordkeeping.

A summary of all test results shall be maintained in each office for 3 years. The summary shall include:

(1) Name of test subject,

(2) Date of testing,

(3) Name of test conductor,

(4) Respirators selected (indicate manufacturer, model, size and approval number),

(5) Testing agent.

III. Irritant Fume Protocol

A. Respirator selection.

Respirators shall be selected as described in section IB above, except that each respirator shall be equipped with a combination of high-efficiency and acid-gas cartridges.

B. Fit test.

1. The test subject shall be allowed to smell a weak concentration of the irritant smoke to familiarize the subject with the characteristic odor.

2. The test subject shall properly don the respirator selected as above, and wear it for at least 10 minutes before starting the fit test.

3. The test conductor shall review this protocol with the test subject before testing.

4. The test subject shall perform the conventional positive pressure and negative pressure fit checks (see ANSI Z88.2 1980). Failure of either check shall be cause to select an alternate respirator.

5. Break both ends of a ventilation smoke tube containing stannic oxychloride, such as the MSA part #5645, or equivalent. Attach a short length of tubing to one end of the smoke tube. Attach the other end of the smoke tube to a low pressure air pump set to deliver 200 milliliters per minute.

6. Advise the test subject that the smoke can be irritating to the eyes and instruct the subject to keep the eyes closed while the test is performed.

7. The test conductor shall direct the stream of irritant smoke from the tube towards the faceseal area of the test subject. The person conducting the test shall begin with the tube at least 12 inches from the facepiece and gradually move to within one inch, moving around the whole perimeter of the mask.

8. The test subject shall be instructed to do the following exercises while the respirator is being challenged by the smoke. Each exercise shall be performed for one minute.

i. Breathe normally.

ii. Breathe deeply. Be certain breaths are *deep* and *regular*.

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

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

v. Talking. Talk aloud and slowly for several minutes. The following paragraph is called the Rainbow Passage. Reading it will result in a wide range of facial movements, and thus be useful to satisfy this requirement. Alternative passages which serve the same purpose may also be used.

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 end 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 his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

vi. Jogging in Place.

vii. Breathe normally.

9. The test subject shall indicate to the test conductor if the irritant smoke is detected. If smoke is detected, the test conductor shall stop the test. In this case, the tested respirator is rejected and another respirator shall be selected.

10. Each test subject passing the smoke test (i.e., without detecting the smoke) shall be given a sensitivity check of smoke from the same tube to determine if the test subject reacts to the smoke. Failure to evoke a response shall void the fit test.

11. Steps B4, B8, B10 of this fit test protocol shall be performed in a location with exhaust ventilation sufficient to prevent general contamination of the testing area by the test agents.

12. At least two facepieces shall be selected by the IAA test protocol. The test subject shall be given the opportunity to wear them for one week to choose the one which is more comfortable to wear.

13. Respirators successfully tested by the protocol may be used in contaminated atmospheres up to ten times the PEL of asbestos.

14. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface.

15. If hair growth or apparel interfere with a satisfactory fit, then they shall be altered or removed so as to eliminate interference and allow a satisfactory fit. If a satisfactory fit is still not attained, the test subject must use a positive-pressure respirator such as powered air-purifying respirators, supplied air respirator, or self-contained breathing apparatus.

16. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician trained in respirator diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

17. Qualitative fit testing shall be repeated at least every six months.

18. In addition, because the sealing of the respirator may be affected, qualitative fit testing shall be repeated immediately when the test subject has a:

(1) Weight change of 20 pounds or more.

(2) Significant facial scarring in the area of the facepiece seal.

(3) Significant dental changes: i.e., multiple extractions without prothesis, or acquiring dentures.

(4) Reconstructive or cosmetic surgery, or

(5) Any other condition that may interfere with facepiece sealing.

C. Recordkeeping.

A summary of all test results shall be maintained in each office for 3 years. The summary shall include:

(1) Name of test subject.

(2) Date of testing.

(3) Name of test conductor.

(4) Respirators selected (indicate manufacturer, model, size and approval number).

(5) Testing agent

Quantitative Fit Test Procedures

1. *General.*

a. The method applies to the negative-pressure nonpowered air-purifying respirators only.

b. The employer shall assign one individual who shall assume the full responsibility for implementing the respirator quantitative fit test program.

2. *Definition.*

a. "Quantitative Fit Test" means the measurement of the effectiveness of a respirator seal in excluding the ambient atmosphere. The test is performed by dividing the measured concentration of challenge agent in a test chamber by the measured concentration of the challenge agent inside the respirator facepiece when the normal air purifying element has been replaced by an essentially perfect purifying element.

b. "Challenge Agent" means the air contaminant introduced into a test chamber so that its concentration inside and outside the respirator may be compared.

c. "Test Subject" means the person wearing the respirator for quantitative fit testing.

d. "Normal Standing Position" means standing erect and straight with arms down along the sides and looking straight ahead.

e. "Fit Factor" means the ratio of challenge agent concentration outside with respect to the inside of a respirator inlet covering (facepiece or enclosure).

3. *Apparatus.*

a. *Instrumentation.* Corn oil, sodium chloride or other appropriate aerosol generation, dilution, and measurement systems shall be used for quantitative fit test.

b. *Test chamber.* The test chamber shall be large enough to permit all test subjects to freely perform all required exercises without distributing the challenge agent concentration or the measurement apparatus. The test chamber shall be equipped and constructed so that the challenge agent is effectively isolated from the ambient air yet uniform in concentration throughout the chamber.

c. When testing air-purifying respirators, the normal filter or cartridge element shall be replaced with a high-efficiency particular filter supplied by the same manufacturer.

d. The sampling instrument shall be selected so that a strip chart record may be made of the test showing the rise and fall of challenge agent concentration with each inspiration and expiration at fit factors of at least 2,000.

e. The combination of substitute air-purifying elements (if any), challenge agent, and challenge agent concentration in the test chamber shall be such that the test subject is not exposed in excess of PEL to the challenge agent at any time during the testing process.

f. The sampling port on the test specimen respirator shall be placed and constructed so that there is no detectable leak around the port, a free air flow is allowed into the sampling line at all times and so there is no interference with the fit or performance of the respirator.

g. The test chamber and test set-up shall permit the person administering the test to observe one test subject inside the chamber during the test.

h. The equipment generating the challenge atmosphere shall maintain the concentration of challenge agent constant within a 10 percent variation for the duration of the test.

i. The time lag (interval between an event and its being recorded on the strip chart) of the instrumentation may not exceed 2 seconds.

j. The tubing for the test chamber atmosphere and for the respirator sampling port shall be the same diameter, length and material. It shall be kept as short as possible. The smallest diameter tubing recommended by the manufacturer shall be used.

k. The exhaust flow from the test chamber shall pass through a high-efficiency filter before release to the room.

l. When sodium chloride aerosol is used, the relative humidity inside the test chamber shall not exceed 50 percent.

4. *Procedural Requirements*

a. The fitting of half-mask respirators should be started with those having multiple sizes and a variety of interchangeable cartridges and canisters such as the MSA Comfo II-M, Norton M, Survivair M, A-O M, or Scott-M. Use either of the tests outlined below to assure that the facepiece is properly adjusted.

(1) *Positive pressure test.* With the exhaust port(s) blocked, the negative pressure of slight inhalation should remain constant for several seconds.

(2) *Negative pressure test.* With the intake port(s) blocked, the negative pressure slight inhalation should remain constant for several seconds.

b. After a facepiece is adjusted, the test subject shall wear the facepiece for at least 5 minutes before conducting a qualitative test by using either of the methods described below and using the exercise regime described in 5.a., b., c., d. and e.

(1) *Isoamyl acetate test.* When using organic vapor cartridges, the test subject who can smell the odor should be unable to detect the odor of isoamyl acetate squirted into the air near the most vulnerable portions of the facepiece seal. In a location which is separated from the test area, the test subject shall be instructed to close her/his eyes during the test period. A combination cartridge or canister with organic vapor and high-efficiency filters shall be used when available for the particular mask being tested. The test subject shall be given an opportunity to smell the odor of isoamyl acetate before the test is conducted.

(2) *Irritant fume test.* When using high-efficiency filters, the test subject should be unable to detect the odor of irritant fume (stannic chloride or titanium tetrachloride ventilation smoke tubes) squirted into the air near the most vulnerable portions of the facepiece seal. The test subject shall be instructed to close her/his eyes during the test period.

c. The test subject may enter the quantitative testing chamber only if she or he has obtained a satisfactory fit as stated in 4.b. of this Appendix.

d. Before the subject enters the test chamber, a reasonably stable challenge agent concentration shall be measured in the test chamber.

e. Immediately after the subject enters the test chamber, the challenge agent concentration inside the respirator shall be measured to ensure that the peak penetration does not exceed 5 percent for a half-mask and 1 percent for a full facepiece.

f. A stable challenge agent concentration shall be obtained prior to the actual start of testing.

(1) Respirator restraining straps may not be overtightened for testing. The straps shall be adjusted by the wearer to give a reasonably comfortable fit typical of normal use.

5. *Exercise Regime.* Prior to entering the test chamber, the test subject shall be given complete instructions as to her/his part in the test procedures. The test subject shall perform the following exercises, in the order given, for each independent test.

a. *Normal Breathing (NB).* In the normal standing position, without talking, the subject shall breathe normally for at least one minute.

b. *Deep Breathing (DB).* In the normal standing position the subject shall do deep breathing for at least one minute pausing so as not to hyperventilate.

c. *Turning head side to side. (SS).* Standing in place the subject shall slowly turn his/her head from side between the extreme positions to each side. The head shall be held at each extreme position for at least 5 seconds. Perform for at least three complete cycles.

d. *Moving head up and down (UD).* Standing in place, the subject shall slowly move his/her head up and down between the extreme position straight up and the extreme position straight down. The head shall be held at each extreme position for at least 5 seconds. Perform for at least three complete cycles.

e. *Reading (R).* The subject shall read out slowly and loud so as to be heard clearly by the test conductor or monitor. The test subject shall read the "rainbow passage" at the end of this section.

f. *Grimace (G).* The test subject shall grimace, smile, frown, and generally contort the face using the facial muscles. Continue for at least 15 seconds.

g. *Bend over and touch toes (B).* The test subject shall bend at the waist and touch toes and return to upright position. Repeat for at least 30 seconds.

h. *Jogging in place (J).* The test subject shall perform jog in place for at least 30 seconds.

i. *Normal Breathing (NB).* Same as exercise a.

Rainbow Passage

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

6. The test shall be terminated whenever any single peak penetration exceeds 5 percent for half-masks and 1 percent for full facepieces. The test subject may be refitted and retested. If two of the three required tests are terminated, the fit shall be deemed inadequate. (See paragraph 4.h.).

7. *Calculation of Fit Factors.*

a. The fit factor determined by the quantitative fit test equals the average concentration inside the respirator.

b. The average test chamber concentration is the arithmetic average of the test chamber concentration at the beginning and of the end of the test.

c. The average peak concentration of the challenge agent inside the respirator shall be the arithmetic average peak concentrations for each of the nine exercises of the test which are computed as the arithmetic average of the peak concentrations found for each breath during the exercise.

d. The average peak concentration for an exercise may be determined graphically if there is not a great variation in the peak concentrations during a single exercise.

8. *Interpretation of Test Results.* The fit factor measured by the quantitative fit testing shall be the lowest of the three protection factors resulting from three independent tests.

9. *Other Requirements.*

a. The test subject shall not be permitted to wear a half-mask or full facepiece mask if the minimum fit factor of 100 or 1,000, respectively, cannot be obtained. If hair growth or apparel interfere with a satisfactory fit, then they shall be altered or removed so as to eliminate interference and allow a satisfactory fit. If a satisfactory fit is still not attained, the test subject must use a positive-pressure respirator such as powered air-purifying respirators, supplied air respirator, or self-contained breathing apparatus.

b. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface.

c. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician trained in respirator diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

d. The test subject shall be given the opportunity to wear the assigned respirator for one week. If the respirator does not provide a satisfactory fit during actual use, the test subject may request another QNFT which shall be performed immediately.

e. A respirator fit factor card shall be issued to the test subject with the following information:

(1) Name.

(2) Date of fit test.

(3) Protection factors obtained through each manufacturer, model and approval number of respirator tested.

(4) Name and signature of the person that conducted the test.

f. Filters used for qualitative or quantitative fit testing shall be replaced weekly, whenever increased breathing resistance is encountered, or when the test agent has altered the integrity of the filter media. Organic vapor cartridges/canisters shall be replaced daily or sooner if there is any indication of breakthrough by the test agent.

10. In addition, because the sealing of the respirator may be affected, quantitative fit testing shall be repeated immediately when the test subject has a:

(1) Weight change of 20 pounds or more,

(2) Significant facial scarring in the area of the facepiece seal,

(3) Significant dental changes; i.e.: multiple extractions without prothesis, or acquiring dentures,

(4) Reconstructive or cosmetic surgery, or

(5) Any other condition that may interfere with facepiece sealing.

11. *Recordkeeping.*

A summary of all test results shall be maintained for 3 years. The summary shall include:

(1) Name of test subject.

(2) Date of testing.

(3) Name of the test conductor.

(4) Fit factors obtained from every respirator tested (indicate manufacturer, model, size and approval number).

Appendix D to § 1928.58—Medical Questionnaires: Mandatory

This mandatory appendix contains the medical questionnaires that must be administered to all employees who are exposed to asbestos, tremolite, anthophyllite, actinolite, or a combination of these minerals above the action level, and who will therefore be included in their employer's medical surveillance program. Part 1 of the appendix contains the Initial Medical Questionnaire, which must be obained for all new hires who will be covered by the medical surveillance requirements. Part 2 includes the abbreviated Periodical Medical Questionnaire, which must be administered to all employees who are provided periodic medical examinations under the medical surveillance provisions of the standard.

BILLING CODE 4510-26-M

Part 1
INITIAL MEDICAL QUESTIONNAIRE

1. NAME _____

2. SOCIAL SECURITY # ___ ___ ___ ___ ___ ___ ___ ___ ___
(1 2 3 4 5 6 7 8 9)

3. CLOCK NUMBER ___ ___ ___ ___ ___ ___
(10 11 12 13 14 15)

4. PRESENT OCCUPATION _____

5. PLANT _____

6. ADDRESS _____

7. _____
(Zip Code)

8. TELEPHONE NUMBER _____

9. INTERVIEWER _____

10. DATE _____ ___ ___ ___ ___ ___ ___
(16 17 18 19 20 21)

11. Date of Birth _____ ___ ___ ___ ___ ___ ___
Month Day Year (22 23 24 25 26 27)

12. Place of Birth _____

13. Sex
1. Male ___
2. Female ___

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

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

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

OCCUPATIONAL HISTORY

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

IF YES TO 17A:

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

Specify job/industry _____ Total Years Worked ___

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

C. Have you ever been exposed to gas or chemical fumes in your work? 1. Yes ___ 2. No ___
Specify job/industry _____ Total Years Worked ___

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

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

1. Job occupation _____

2. Number of years employed in this occupation _____

3. Position/Job title _____

4. Business, field or industry _____

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

Have you ever worked:

		YES	NO
E.	In a mine?.....	[ ]	[ ]
F.	In a quarry?.....	[ ]	[ ]
G.	In a foundry?.....	[ ]	[ ]
H.	In a pottery?.....	[ ]	[ ]
I.	In a cotton, flax or hemp mill?.....	[ ]	[ ]
J.	With asbestos?.....	[ ]	[ ]

18. PAST MEDICAL HISTORY

		YES	NO
A.	Do you consider yourself to be in good health?	[ ]	[ ]
	If "NO" state reason _____		
B.	Have you any defect of vision?.....	[ ]	[ ]
	If "YES" state nature of defect _____		
C.	Have you any hearing defect?.....	[ ]	[ ]
	If "YES" state nature of defect _____		

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

a. Epilepsy (or fits, seizures, convulsions)? [__] [__]

b. Rheumatic fever? [__] [__]

c. Kidney disease? [__] [__]

d. Bladder disease? [__] [__]

e. Diabetes? [__] [__]

f. Jaundice? [__] [__]

19. CHEST COLDS AND CHEST ILLNESSES

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

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

IF YES TO 20A:

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

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

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

22. Have you ever had any of the following?

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

IF YES TO 1A:

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

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

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

IF YES TO 2A:

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

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

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

IF YES TO 3A:

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

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

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

IF YES TO 23A:

B. Do you still have it? 1. Yes __ 2. No __ 3. Does Not Apply __

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

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

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

IF YES TO 24A:

B. Do you still have it? 1. Yes __ 2. No __ 3. Does Not Apply __

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

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

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

IF YES TO 25A:

B. Do you still have it? 1. Yes __ 2. No __ 3. Does Not Apply __

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

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

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

26. Have you ever had:

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

If yes, please specify _____

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

If yes, please specify _____

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

If yes, please specify _____

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

IF YES TO 27A:

B. Have you ever had treatment for heart trouble in the past 10 years? 1. Yes __ 2. No __ 3. Does Not Apply __

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

IF YES TO 28A:

B. Have you had any treatment for high blood pressure (hypertension) in the past 10 years? 1. Yes __ 2. No __ 3. Does Not Apply __

29. When did you last have your chest X-rayed? (Year) 25 __ 26 __ 27 __ 28 __

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

What was the outcome? _____

FAMILY HISTORY

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

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

H. Please specify cause of death _____ _____

COUGH

32A. Do you usually have a cough? (Count a cough with first smoke or on first going out of doors. Exclude clearing of throat.) (If no, skip to question 32C.) 1. Yes __ 2. No __

B. Do you usually cough as much as 4 to 6 times a day 4 or more days out of the week? 1. Yes __ 2. No __

C. Do you usually cough at all on getting up or first thing in the morning? 1. Yes __ 2. No __

D. Do you usually cough at all during the rest of the day or at night? 1. Yes __ 2. No __

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

E. Do you usually cough like this on most days for 3 consecutive months or more during the year? 1. Yes __ 2. No __ 3. Does not apply __

F. For how many years have you had the cough? Number of years __ Does not apply __

33A. Do you usually bring up phlegm from your chest? (Count phlegm with the first smoke or on first going out of doors. Exclude phlegm from the nose. Count swallowed phlegm.) (If no, skip to 33C) 1. Yes __ 2. No __

B. Do you usually bring up phlegm like this as much as twice a day 4 or more days out of the week? 1. Yes __ 2. No __

C. Do you usually bring up phlegm at all on getting up or first thing in the morning? 1. Yes __ 2. No __

D. Do you usually bring up phlegm at all during the rest of the day or at night? 1. Yes __ 2. No __

IF YES TO ANY OF THE ABOVE (33A, B, C, or D), ANSWER THE FOLLOWING: IF NO TO ALL, CHECK DOES NOT APPLY AND SKIP TO 34A.

E. Do you bring up phlegm like this on most days for 3 consecutive months or more during the year? 1. Yes __ 2. No __ 3. Does not apply __

F. For how many years have you had trouble with phlegm? — Number of years __ Does not apply __

EPISODES OF COUGH AND PHLEGM

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

IF YES TO 34A

B. For how long have you had at least 1 such episode per year? — Number of years __ Does not apply __

WHEEZING

35A. Does your chest ever sound wheezy or whistling

1. When you have a cold? — 1. Yes __ 2. No __
2. Occasionally apart from colds? — 1. Yes __ 2. No __
3. Most days or nights? — 1. Yes __ 2. No __

IF YES TO 1, 2, or 3 in 35A

B. For how many years has this been present? — Number of years __ Does not apply __

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

IF YES TO 36A

B. How old were you when you had your first such attack? — Age in years __ Does not apply __

C. Have you had 2 or more such episodes? — 1. Yes __ 2. No __ 3. Does not apply __

D. Have you ever required medicine or treatment for the(se) attack(s)? — 1. Yes __ 2. No __ 3. Does not apply __

BREATHLESSNESS

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

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

IF YES TO 38A

B. Do you have to walk slower than people of your age on the level because of breathlessness? — 1. Yes __ 2. No __ 3. Does not apply __

C. Do you ever have to stop for breath when walking at your own pace on the level? — 1. Yes __ 2. No __ 3. Does not apply __

D. Do you ever have to stop for breath after walking about 100 yards (or after a few minutes) on the level? — 1. Yes __ 2. No __ 3. Does not apply __

E. Are you too breathless to leave the house or breathless on dressing or climbing one flight of stairs? — 1. Yes __ 2. No __ 3. Does not apply __

TOBACCO SMOKING

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

IF YES TO 39A

B. Do you now smoke cigarettes (as of one month ago) — 1. Yes __ 2. No __ 3. Does not apply __

C. How old were you when you first started regular cigarette smoking? — Age in years __ Does not apply __

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

E. How many cigarettes do you smoke per day now? — Cigarettes per day __ Does not apply __

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

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

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

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

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

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

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

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

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

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

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

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

2. If you have stopped smoking cigars completely, how old were you when you stopped. — Age stopped __; Check if still smoking cigars __; Does not apply __

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

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

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

Signature _____ Date _____

Part 2
PERIODIC MEDICAL QUESTIONNAIRE

1. NAME _____

2. SOCIAL SECURITY # __ __ __ __ __ __ __ __ __ __ (1 2 3 4 5 6 7 8 9)

3. CLOCK NUMBER __ __ __ __ __ __ (10 11 12 13 14 15)

4. PRESENT OCCUPATION _____

5. PLANT _____

6. ADDRESS _____

7. _____ (Zip Code)

8. TELEPHONE NUMBER _____

9. INTERVIEWER _____

10. DATE _____ __ __ __ __ __ __ (16 17 18 19 20 21)

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

12. OCCUPATIONAL HISTORY

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

IF YES TO 12A:

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

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

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

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

12F. In the past year, what was your: — 1. Job/occupation? _____ 2. Position/job title? _____

13. RECENT MEDICAL HISTORY

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

If NO, state reason _____

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

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

14. CHEST COLDS AND CHEST ILLNESSES

14A. If you get a cold, does it usually go to your chest? (Usually means more than 1/2 the time)

1. Yes ___ 2. No ___
3. Don't get colds ___

15A. During the past year, have you had any chest illnesses that have kept you off work, indoors at home, or in bed?

1. Yes ___ 2. No ___
3. Does Not Apply ___

If YES TO 15A:

15B. Did you produce phlegm with any of these chest illnesses?

1. Yes ___ 2. No ___
3. Does Not Apply ___

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

Number of illnesses ___
No such illnesses ___

16. RESPIRATORY SYSTEM

In the past year have you had:

	Yes or No	Further Comment on Positive Answers
Asthma	___	
Bronchitis	___	
Hay Fever	___	
Other Allergies	___	

	Yes or No	Further Comment on Positive Answers
Pneumonia	___	
Tuberculosis	___	
Chest Surgery	___	
Other Lung Problems	___	
Heart Disease	___	

Do you have:

	Yes or No	Further Comment on Positive Answers
Frequent colds	___	
Chronic cough	___	
Shortness of breath when walking or climbing one flight of stairs	___	
Do you:		
Wheeze	___	
Cough up phlegm	___	
Smoke cigarettes	___	Packs per day ___ How many years ___

Date _____ Signature _____

BILLING CODE 4510-28-C

Appendix E to § 1926.58—Interpretation and Classification of Chest Roentgenograms—Mandatory

(a) Chest roentgenograms shall be interpreted and classified in accordance with a professionally accepted classification system and recorded on a Roentgenographic Interpretation Form. "Form CSD/NIOSH (M) 2.8.

(b) Roentgenograms shall be interpreted and classified only by a B-reader, a board eligible/certified radiologist, or an experienced physician with known expertise in pneumoconioses.

(c) All interpreters, whenever interpreting chest roentgenograms made under this section, shall have immediately available for reference a complete set of the ILO-U/C International Classification of Radiographs for Pneumoconioses, 1980.

Appendix F to 1926.58—Work Practices and Engineering Controls for Major Asbestos Removal, Renovation, and Demolition Operations—Non-Mandatory

This is a non-mandatory appendix designed to provide guidelines to assist employers in complying with the requirements of 29 CFR 1926.58. Specifically, this appendix describes the equipment, methods, and procedures that should be used in major asbestos removal projects conducted to abate a recognized asbestos hazard or in preparation for building renovation or demolition. These projects require the construction of negative-pressure temporary enclosures to contain the asbestos material and to prevent the exposure of bystanders and other employees at the worksite. Paragraph (e)(6) of the standard requires that "... [W]henever feasible, the employer shall establish negative-pressure enclosures before commencing asbestos removal, demolition, or renovation operations." Employers should also be aware that, when conducting asbestos removal projects, they may be required under the National Emissions Standards for Hazardous Air Pollutants (NESHAPS), 40 CFR Part 61, Subpart M, or EPA regulations under the Clear Water Act.

Construction of a negative-pressure enclosure is a simple but time-consuming process that requires careful preparation and execution; however, if the procedures below are followed, contractors should be assured of achieving a temporary barricade that will protect employees and others outside the enclosure from exposure to asbestos and minimize to the extent possible the exposure of asbestos workers inside the barrier as well.

The equipment and materials required to construct these barriers are readily available and easily installed and used. In addition to an enclosure around the removal site, the standard requires employers to provide hygiene facilities that ensure that their asbestos contaminated employees do not leave the work site with asbestos on their persons or clothing; the construction of these facilities is also described below. The steps in the process of preparing the asbestos removal site, building the enclosure, constructing hygiene facilities, removing the asbestos-containing material, and restoring the site include:

(1) Planning the removal project;
(2) Procuring the necessary materials and equipment;
(3) Preparing the work area;
(4) Removing the asbestos-containing material;
(5) Cleaning the work area; and
(6) Disposing of the asbestos-containing waste.

Planning the Removal Project

The planning of an asbestos removal project is critical to completing the project safely and cost-effectively. A written asbestos removal plan should be prepared that describes the equipment and procedures that will be used throughout the project. The asbestos abatement plan will aid not only in executing the project but also in complying with the reporting requirements of the USEPA asbestos regulations (40 CFR 61, Subpart M), which call for specific information such as a description of control methods and control equipment to be used and the disposal sites the contractor proposes to use to dispose of the asbestos containing materials.

The asbestos abatement plan should contain the following information:

- A physical description of the work area;
- A description of the approximate amount of material to be removed;
- A schedule for turning off and sealing existing ventilation systems;
- Personnel hygiene procedures;
- Labeling procedures;
- A description of personal protective equipment and clothing to be worn by employees;
- A description of the local exhaust ventilation systems to be used;
- A description of work practices to be observed by employees;
- A description of the methods to be used to remove the asbestos-containing material;
- The wetting agent to be used;
- A description of the sealant to be used at the end of the project;
- An air monitoring plan;
- A description of the method to be used to transport waste material; and
- The location of the dump site.

Materials and Equipment Necessary for Asbestos Removal

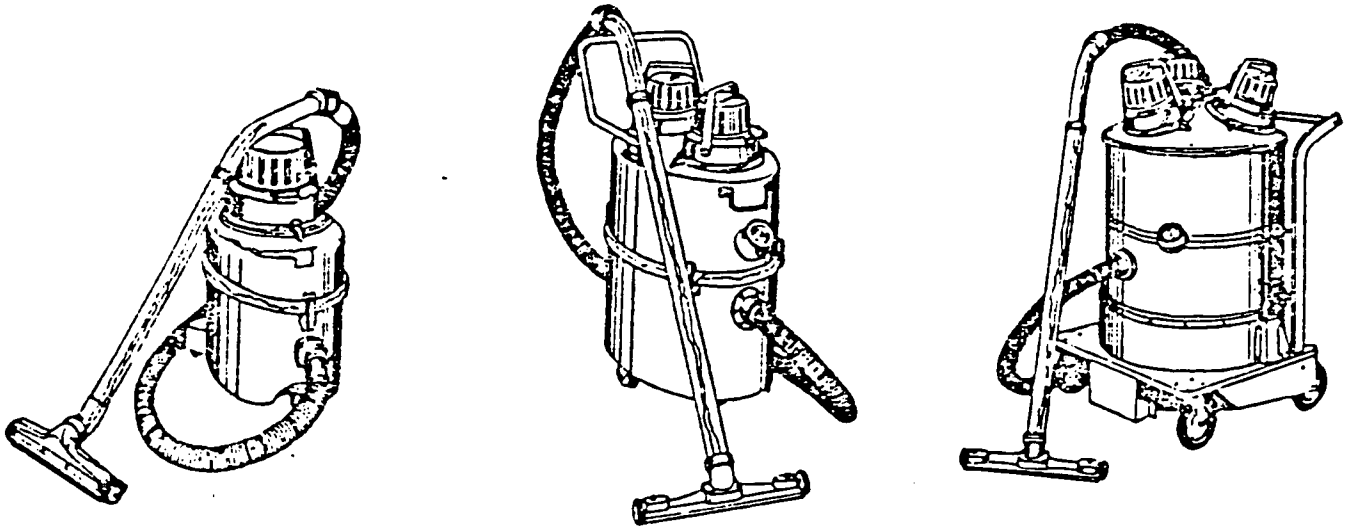
Although individual asbestos removal projects vary in terms of the equipment required to accomplish the removal of the material, some equipment and materials are common to most asbestos removal operations. Equipment and materials that should be available at the beginning of each project are: (1) rolls of polyethylene sheeting; (2) rolls of gray duct tape or clear plastic tape; (3) HEPA filtered vacuum(s); (4) HEPA-filtered portable ventilation system(s); (5) a wetting agent; (6) an airless sprayer; (7) a portable shower unit; (8) appropriate respirators; (9) disposable coveralls; (10) signs and labels; (11) pre-printed disposal bags; and (12) a manometer or pressure gauge.

Rolls of Polyethylene Plastic and Tape. Rolls of polyethylene plastic (6 mil in thickness) should be available to construct the asbestos removal enclosure and to seal windows, doors, ventilation systems, wall penetrations, and ceilings and floors in the work area. Gray duct tape or clear plastic tape should be used to seal the edges of the plastic and to seal any holes in the plastic enclosure. Polyethylene plastic sheeting can be purchased in rolls up to 12-20 feet in width and up to 100 feet in length.

HEPA-Filtered Vacuum. A HEPA-filtered vacuum is essential for cleaning the work area after the asbestos has been removed. Such vacuums are designed to be used with a HEPA (High Efficiency Particulate Air) filter, which is capable of removing 99.97 percent of the asbestos particles from the air. Various sizes and capacities of HEPA vacuums are available. One manufacturer, Nilfisk of America, Inc.*, produces three models that range in capacity from 5.25 gallons to 17 gallons (see Figure F-1). All of these models are portable, and all have long hoses capable of reaching out-of-the-way places, such as areas above ceiling tiles, behind pipes, etc.

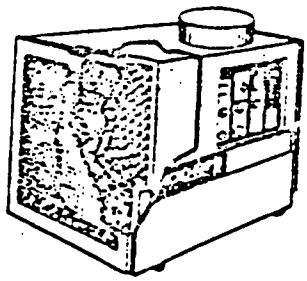
Exhaust Air Filtration System. A portable ventilation system is necessary to create a negative pressure within the asbestos removal enclosure. Such units are equipped with a HEPA filter and are designed to exhaust and clean the air inside the enclosure before exhausting it to the outside of the enclosure (See Figure F-2). Systems are available from several manufacturers. One supplier, Micro-Trap, Inc.,* has two ventilation units that range in capacity from 600 cubic feet per minute (CFM) to 1,700 CFM. According to the manufacturer's literature, Micro-Trap * units filter particles of 0.3 micron in size with an efficiency of 99.99 percent. The number and capacity of units required to ventilate an enclosure depend on the size of the area to be ventilated.

* Mention of trade names or commercial products does not constitute endorsement or recommendation for use.



Source: Product Catalog, Asbestos Control Technologies, Inc., Maple Shade, N.J., 1985.

Figure F-1. HEPA Filtered Vacuums



Source: Product Catalog, Asbestos Control Technologies, Inc., Maple Shade, N.J., 1985.

Figure F-2. Portable Exhaust Ventilation System with HEPA Filter

Wetting Agents. Wetting agents (surfactants) are added to water (which is then called amended water) and used to soak asbestos-containing materials; amended water penetrates more effectively than plain water and permits more thorough soaking of the asbestos-containing materials. Wetting the asbestos-containing material reduces the number of fibers that will break free and become airborne when the asbestos-containing material is handled or otherwise disturbed. Asbestos-containing materials should be thoroughly soaked before removal is attempted; the dislodged material should feel spongy to the touch. Wetting agents are generally prepared by mixing 1 to 3 ounces of wetting agent to 5 gallons of water.

One type of asbestos, amosite, is relatively resistant to soaking, either with plain or amended water. The work practices of choice when working with amosite containing material are to soak the material as much as possible and then to bag it for disposal immediately after removal, so that the material has no time to dry and be ground into smaller particles that are more likely to liberate airborne asbestos.

In a very limited number of situations, it may not be possible to wet the asbestos-containing material before removing it. Examples of such rare situations are: (1) Removal of asbestos material from a "live" electrical box that was oversprayed with the material when the rest of the area was sprayed with asbestos-containing coating; and (2) removing asbestos-containing insulation from a live steam pipe. In both of these situations, the preferred approach would be to turn off the electricity or steam, respectively, to permit wet removal methods to be used. However, where removal work must be performed during working hours, i.e., when normal operations cannot be disrupted, the asbestos-containing material must be removed dry. Immediate bagging is then the only method of minimizing the amount of airborne asbestos generated.

Airless Sprayer. Airless sprayers are used to apply amended water to asbestos-containing materials. Airless sprayers allow the amended water to be applied in a fine spray that minimizes the release of asbestos fibers by reducing the impact of the spray on the material to be removed. Airless sprayers are inexpensive and readily available.

Portable Shower. Unless the site has available a permanent shower facility that is contiguous to the removal area, a portable shower system is necessary to permit employees to clean themselves after exposure to asbestos and to remove any asbestos contamination from their hair and bodies. Taking a shower prevents employees from leaving the work area with asbestos on their clothes and thus prevents the spread of asbestos contamination to areas outside the asbestos removal area. This measure also protects members of the families of asbestos workers from possible exposure to asbestos. Showers should be supplied with warm water and a drain. A shower water filtration system to filter asbestos fibers from the shower water is recommended. Portable shower units are readily available, inexpensive, and easy to install and transport.

Respirators. Employees involved in asbestos removal projects should be provided with appropriate NIOSH-approved respirators. Selection of the appropriate respirator should be based on the concentration of asbestos fibers in the work area. If the concentration of asbestos fibers is unknown, employees should be provided with respirators that will provide protection against the highest concentration of asbestos fibers that can reasonably be expected to exist in the work area. For most work within an enclosure, employees should wear half-mask dual-filter cartridge respirators. Disposable face mask respirators (single-use) should not be used to protect employees from exposure to asbestos fibers.

Disposable Coveralls. Employees involved in asbestos removal operations should be provided with disposable impervious coveralls that are equipped with head and foot covers. Such coveralls are typically made of Tyvek.[1] The coverall has a zipper front and elastic wrists and ankles.

Signs and Labels. Before work begins, a supply of signs to demarcate the entrance to the work area should be obtained. Signs are available that have the wording required by the final OSHA standard. The required labels are also commercially available as press-on labels and pre-printed on the 6-mil polyethylene plastic bags used to dispose of asbestos-containing waste material.

Preparing the Work Area

Preparation for constructing negative-pressure enclosures should begin with the removal of all movable objects from the work area, e.g., desks, chairs, rugs, and light fixtures, to ensure that these objects do not become contaminated with asbestos. When movable objects are contaminated or are suspected of being contaminated, they should be vacuumed with a HEPA vacuum and cleaned with amended water, unless they are made of material that will be damaged by the wetting agent; wiping with plain water is recommend in those cases where amended water will damage the object. Before the asbestos removal work begins, objects that

[1] Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

cannot be removed from the work area should be covered with a 6-mil-thick polyethylene plastic sheeting that is securely taped with duct tape or plastic tape to achieve an air-tight seal around the object.

Constructing the Enclosure

When all objects have either been removed from the work area or covered with plastic, all penetrations of the floor, walls, and ceiling should be sealed with 6-mil polyethylene plastic and tape to prevent airborne asbestos from escaping into areas outside the work area of from lodging in cracks around the penetrations. Penetrations that require sealing are typically found around electrical conduits, telephone wires, and water supply and drain pipes. A single entrance to be used for access and egress to the work area should be selected, and all other doors and windows should be sealed with tape or be covered with 6-mil polyethylene plastic sheeting and securely taped. Covering windows and unnecessary doors with a layer of polyethylene before covering the walls provides a second layer of protection and saves time in installation because it reduces the number of edges that must be cut and taped. All other surfaces such as support columns, ledges, pipes, and other surfaces should also be covered with polyethylene plastic sheeting and taped before the walls themselves are completely covered with sheeting.

Next a thin layer of spray adhesive should be sprayed along the top of all walls surrounding the enclosed work area, close to the wall-ceiling interface, and a layer of polyethylene plastic sheeting should be stuck to this adhesive and taped. The entire inside surfaces of all wall areas are covered in this manner, and the sheeting over the walls is extended across the floor area until it meets in the center of the area, where it is taped to form a single layer of material encasing the entire room except for the ceiling. A final layer of plastic sheeting is then laid across the plastic-covered floor area and up the walls to a level of 2 feet or so; this layer provides a second protective layer of plastic sheeting over the floor, which can then be removed and disposed of easily after the asbestos-containing material that has dropped to the floor has been bagged and removed.

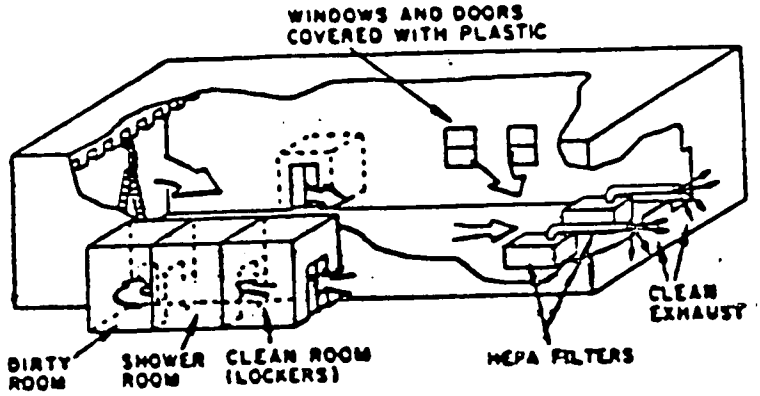
Building Hygiene Facilities

Paragraph (j) of the final standard mandates that employers involved in asbestos removal, demolition, or renovation operations provide their employees with hygiene facilities to be used to decontaminate asbestos-exposed workers, equipment, and clothing before such employees leave the work area. These decontamination facilities consist of:

(1) A clean change room;
(2) A shower; and
(3) An equipment room.

The clean change room is an area in which employees remove their street clothes and don their respirators and disposable protective clothing. The clean room should have hooks on the wall or be equipped with lockers for the storage of workers' clothing and personal articles. Extra disposable coveralls and towels can also be stored in the clean change room.

The shower should be contiguous with both the clean and dirty change room (see Figure F-3) and should be used by all workers leaving the work area. The shower should also be used to clean asbestos-contaminated equipment and materials, such as the outsides of asbestos waste bags and hand tools used in the removal process.



Source: EPA 1985. Asbestos Waste Management Guidance (EPA/530-SW-85-007).

Figure F-3. Cutaway View of Enclosure and Hygiene Facilities

The equipment room (also called the dirty change room) is the area where workers remove their protective coveralls and where equipment that is to be used in the work area can be stored. The equipment room should be lined with 6-mil-thick polyethylene plastic sheeting in the same way as was done in the work area enclosure. Two layers of 6-mil polyethylene plastic sheeting that are not taped together from a double flap or barrier between the equipment room and the work area and between the shower and the clean change room (see Figure F-4).

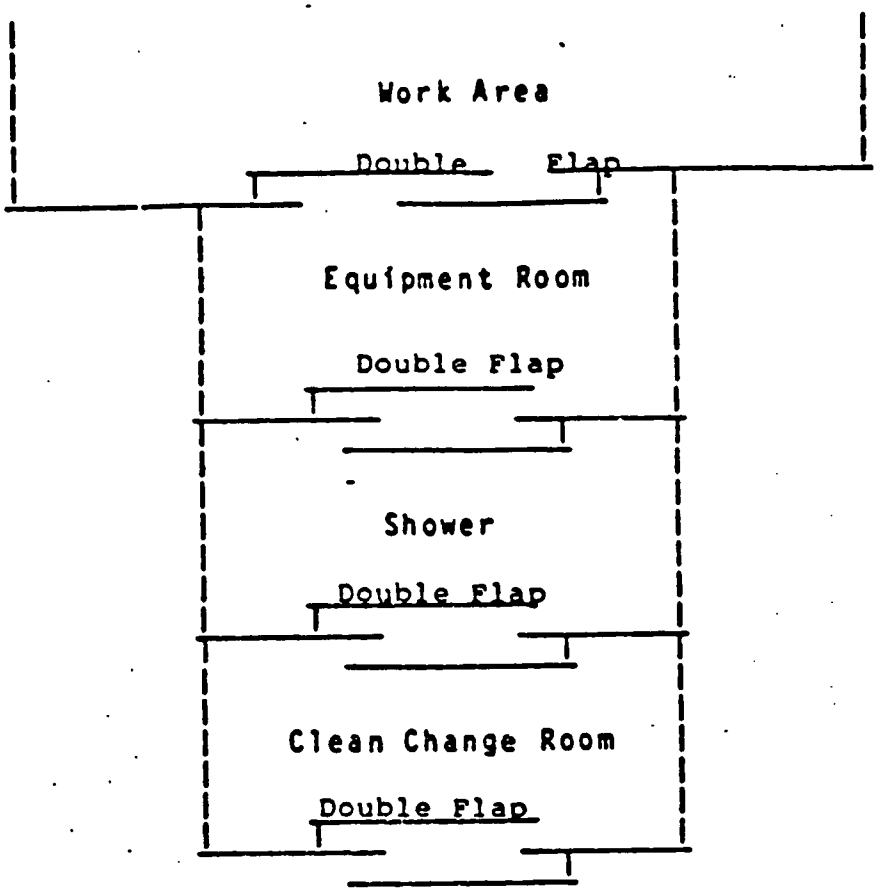


Figure F–4. Typical Hygiene Facility Layout

When feasible, the clean change room, shower, and equipment room should be contiguous and adjacent to the negative-pressure enclosure surrounding the removal area. In the overwhelming number of cases, hygiene facilities can be built contiguous to the negative-pressure enclosure. In some cases, however, hygiene facilities may have to be located on another floor of the building where removal of asbestos-containing materials is taking place. In these instances, the hygiene facilities can in effect be made to be contiguous to the work area by constructing a polythylene plastic "tunnel" from the work area to the hygiene facilities. Such a tunnel can be made even in cases where the hygiene facilities are located several floors above or below the work area; the tunnel begins with a double flap door at the enclosure, extends through the exit from the floor, continues down the necessary number of flights of stairs and goes through a double-flap entrance to the hygiene facilities, which have been prepared as described above. The tunnel is constructed of 2-inch by 4-inch lumber or aluminum struts and covered with 6-mil-thick polyethylene plastic sheeting.

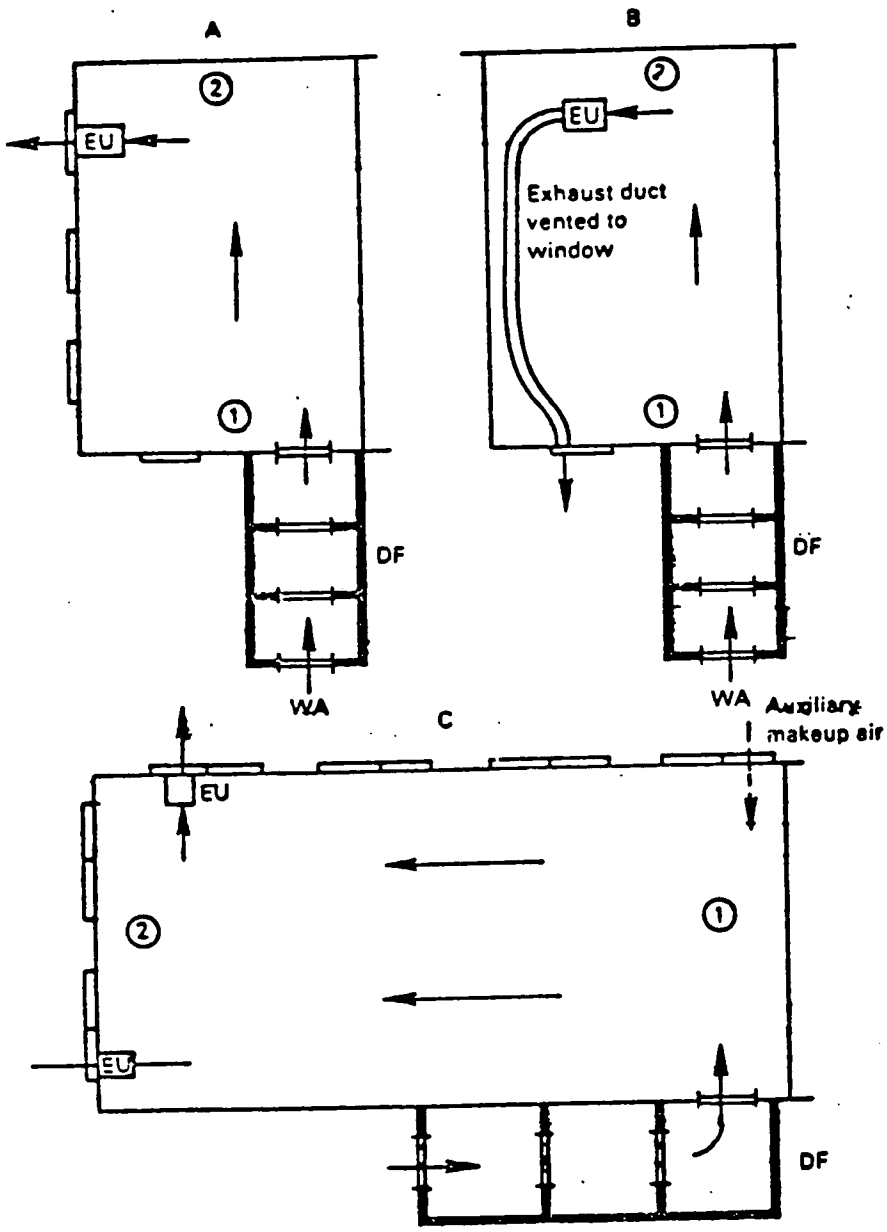
In the rare instances when there is not enough space to permit any hygiene facilities to be built at the work site, employees should be directed to change into a clean disposable worksuit immediately after exiting the enclosure (without removing their respirators) and to proceed immediately to the shower. Alternatively, employees could be directed to vacuum their disposable coveralls with a HEPA-filtered vacuum before proceeding to a shower located a distance from the enclosure.

The clean room, shower, and equipment room must be sealed completely to ensure that the sole source of air flow through these areas originates from uncontaminated areas outside the asbestos removal, demolition, or renovation enclosure. The shower must be drained properly after each use to ensure that contaminated water is not released to uncontaminated areas. If waste water is inadvertently released, it should be cleaned up as soon as possible to prevent any asbestos in the water from drying and becoming airborne in areas outside the work area.

Establishing Negative Pressure Within the Enclosure

After construction of the enclosure is completed, a ventilation system(s) should be installed to create a negative pressure within the enclosure with respect to the area outside the enclosure. Such ventilation systems must be equipped with HEPA filters to prevent the release of asbestos fibers to the environment outside the enclosure and should be operated 24 hours per day during the entire project until the final cleanup is completed and the results of final air samples are received from the laboratory. A sufficient amount of air should be exhausted to create a pressure of −0.02 inches of water within the enclosure with respect to the area outside the enclosure.

These ventilation systems should exhaust the HEPA-filtered clean air outside the building in which the asbestos removal, demolition, or renovation is taking place (see Figure F–5). If access to the outside is not available, the ventilation system can exhaust the HEPA-filtered asbestos-free air to an area within the building that is as far away as possible from the enclosure. Care should be taken to ensure that the clean air is released either to an asbestos-free area or in such a way as not to disturb any asbestos-containing materials.



Source: EPA 1985. Guidance for Controlling Asbestos-Containing materials in Buildings (EPA 560/5-85-024).

Figure F-8. 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, 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.

A manometer or pressure gauge for measuring the negative pressure within the enclosure should be installed and should be monitored frequently throughout all work shifts during which asbestos removal, demolition, or renovation takes place. Several types of manometers and pressure gauges are available for this purpose.

All asbestos removal, renovation, and demolition operations should have a program for monitoring the concentration of airborne asbestos and employee exposures to asbestos. Area samples should be collected inside the enclosure (approximately four samples for 5000 square feet of enclosure area). At least two samples should be collected outside the work area, one at the entrance to the clean change room and one at the exhaust of the portable ventilation system. In addition, several breathing zone samples should be collected from those workers who can reasonably be expected to have the highest potential exposure to asbestos.

Removing Asbestos Materials

Paragraph (e)(6)(ii) requires that employers involved in asbestos removal, demolition, or renovation operations designate a competent person to:

(1) Set up the enclosure;
(2) Ensure the integrity of the enclosure;
(3) Control entry to and exit from the enclosure;
(4) Supervise all employee exposure monitoring required by this section;
(5) Ensure the use of protective clothing and equipment;
(6) Ensure that employees are trained in the use of engineering controls, work practices, and personal protective equipment;
(7) Ensure the use of hygiene facilities and the observance of proper decontamination procedures; and
(8) Ensure that engineering controls are functioning properly.

The competent person will generally be a Certified Industrial Hygienist, an industrial hygienist with training and experience in the handling of asbestos, or a person who has such training and experience as a result of on-the-job training and experience.

Ensuring the integrity of the enclosure is accomplished by inspecting the enclosure before asbestos removal work begins and prior to each work shift throughout the entire period work is being conducted in the enclosure. The inspection should be conducted by locating all areas where air might escape from the enclosure; this is best accomplished by running a hand over all seams in the plastic enclosure to ensure that no seams are ripped and the tape is securely in place.

The competent person should also ensure that all unauthorized personnel do not enter the enclosure and that all employees and other personnel who enter the enclosure have the proper protective clothing and equipment. He or she should also ensure that all employees and other personnel who enter the enclosure use the hygiene facilities and observe the proper decontamination procedures (described below).

Proper work practices are necessary during asbestos removal, demolition, and renovation to ensure that the concentration of asbestos fibers inside the enclosure remains as low as possible. One of the most important work practices is to wet the asbestos-containing material before it is disturbed. After the asbestos-containing material is thoroughly wetted, it should be removed by scraping (as in the case of sprayed-on or troweled-on ceiling material) or removed by cutting the metal bands or wire mesh that support the asbestos-containing material on boilers or pipes. Any residue that remains on the surface of the object from which asbestos is being removed should be wire brushed and wet wiped.

Bagging asbestos waste material promptly after its removal is another work practice control that is effective in reducing the airborne concentration of asbestos within the

enclosure. Whenever possible, the asbestos should be removed and placed directly into bags for disposal rather than dropping the material to the floor and picking up all of the material when the removal is complete. If a significant amount of time elapses between the time that the material is removed and the time it is bagged, the asbestos material is likely to dry out and generate asbestos-laden dust when it is disturbed by people working within the enclosure. Any asbestos-contaminated supplies and equipment that cannot be decontaminated should be disposed of in pre-labeled bags; items in this category include plastic sheeting, disposable work clothing, respirator cartridges, and contaminated wash water.

A checklist is one of the most effective methods of ensuring adequate surveillance of the integrity of the asbestos removal enclosure. Such a checklist is shown in Figure F-6. Filling out the checklist at the beginning of each shift in which asbestos removal is being performed will serve to document that all the necessary precautions will be taken during the asbestos removal work. The checklist contains entries for ensuring that:

- The work area enclosure is complete;
- The negative-pressure system is in operation;
- Necessary signs and labels are used;

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Asbestos Removal, Renovation, and Demolition Checklist

Date: _____ Location: _____

Supervisor _____ Project # _____

Work Area (sq. ft.) _____

		Yes	No
I.	Work site barrier		
	Floor covered	____	____
	Walls covered	____	____
	Area ventilation off	____	____
	All edges sealed	____	____
	Penetrations sealed	____	____
	Entry curtains	____	____
II.	Negative Air Pressure		
	HEPA Vac _____ Ventilation system _____		
	Constant operation	____	____
	Negative pressure achieved	____	____
III.	Signs		
	Work area entrance	____	____
	Bags labeled	____	____
IV.	Work Practices		
	Removed material promptly bagged	____	____
	Material worked wet	____	____
	HEPA vacuum used	____	____
	No smoking	____	____
	No eating, drinking	____	____
	Work area cleaned after completion	____	____
	Personnel decontaminated each departure	____	____
V.	Protective Equipment		
	Disposable clothing used one time	____	____
	Proper NIOSH-approved respirators	____	____
VII.	Showers		
	On site	____	____
	Functioning	____	____
	Soap and towels	____	____
	Used by all personnel	____	____

Figure F-6. Checklist

BILLING CODE 4510-26-C

- Appropriate work practices are used;
- Necessary protective clothing and equipment are used; and
- Appropriate decontamination procedures are being followed.

Cleaning the Work Area

After all of the asbestos-containing material is removed and bagged, the entire work area should be cleaned until it is free of all visible asbestos dust. All surfaces from which asbestos has been removed should be cleaned by wire brushing the surfaces, HEPA vacuuming these surfaces, and wiping them with amended water. The inside of the plastic enclosure should be vacuumed with a HEPA vacuum and wet wiped until there is no visible dust in the enclosure. Particular attention should be given to small horizontal surfaces such as pipes, electrical conduits, lights, and support tracks for drop ceilings. All such surfaces should be free of visible dust before the final air samples are collected.

Additional sampling should be conducted inside the enclosure after the cleanup of the work area has been completed. Approximately four area samples should be collected for each 5000 square feet of enclosure area. The enclosure should not be dismantled unless the final samples show asbestos concentrations of less than the final standard's action level. EPA recommends that a clearance level of 0.01 f/cc be achieved before cleanup is considered complete.

A clearance checklist is an effective method of ensuring that all surfaces are adequately cleaned and the enclosure is ready to be dismantled. Figure F-7 shows a checklist that can be used during the final inspection phase of asbestos abatement, removal, or renovation operations.

BILLING CODE 4510-26-M

Final Inspection of Asbestos Removal, Renovation, and Demolition Projects

Date: _____
Project: _____
Location: _____
Building: _____

CHECKLIST:

Residual dust on:	Yes	No		Yes	No
a. Floor	____	____	e. Horizontal surfaces	____	____
b. Horizontal surfaces	____	____	f. Pipes	____	____
c. Pipes	____	____	g. Ducts	____	____
d. Ventilation equipment	____	____	h. Register	____	____
			i. Lights	____	____

FIELD NOTES:
Record any problems encountered here.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

FINAL AIR SAMPLE RESULTS: _____
_____
_____

Figure F-7. Clearance Checklist

BILLING CODE 4510-26-C

Appendix G to § 1926.58—Work Practices and Engineering Controls for Small-Scale, Short-Duration Asbestos Renovation and Maintenance Activities—Non-Mandatory

This appendix is not mandatory, in that construction industry employers may choose to comply with all of the requirements of OSHA's final rule for occupational exposure to asbestos in the construction industry, § 1926.58. However, employers wishing to be exempted from the requirements of paragraphs (e)(6) and (f)(2)(iii)(*B*) of § 1926.58 shall comply with the provisions of this appendix when performing small-scale, short-duration renovation or maintenance activities. OSHA anticipates that employers in the electrical, carpentry, utility, plumbing, and interior construction trades may wish to avail themselves of the final standard's exemptions for small-scale, short-duration renovation and maintenance operations.

Definition of Small-Scale, Short-Duration Activities

For the purposes of this appendix, small-scale, short-duration renovation and maintenance activities are tasks such as, but not limited to:

- Removal of asbestos-containing insulation on pipes;
- Removal of small quantities of asbestos-containing insulation on beams or above ceilings;
- Replacement of an asbestos-containing gasket on a valve;
- Installation or removal of a small section of drywall;
- Installation of electrical conduits through or proximate to asbestos-containing materials.

Evidence in the record (see the Summary and Explanation section of the preamble for paragraph (g), Methods of Compliance, for specific citations) suggests that the use of certain engineering and work practice controls is capable of reducing employee exposures to asbestos to levels below the final standard's action level (0.1 f/cc). Several controls and work practices, used either singly or in combination, can be employed effectively to reduce asbestos exposures during small maintenance and renovation operations. These include:

- Wet methods;
- Removal methods
  —Use of Glove bags
  —Removal of entire asbestos insulated pipes or structures
  —Use of mini-enclosures
- Enclosure of asbestos materials; and
- Maintenance programs.

This appendix describes these controls and work practices in detail.

Preparation of the Area Before Renovation or Maintenance Activities

The first step in preparing to perform a small-scale, short-duration asbestos renovation or maintenance task, regardless of the abatement method that will be used, is the removal from the work area of all objects that are movable to protect them from asbestos contamination. Objects that cannot be removed must be covered completely with a 6-mil-thick polyethylene plastic sheeting before the task begins. If objects have already been contaminated, they should be thoroughly cleaned with a High Efficiency Particulate Air (HEPA) filtered vacuum or be wet wiped before they are removed from the work area or completely encased in the plastic.

Wet Methods

Whenever feasible, and regardless of the abatement method to be used (e.g., removal, enclosure, use of glove bags), wet methods must be used during small-scale, short duration maintenance and renovation activities that involve disturbing asbestos-containing materials. Handling asbestos materials wet is one of the most reliable methods of ensuring that asbestos fibers do not become airborne, and this practice should therefore be used whenever feasible. As discussed in the Summary and Explanation section of the preamble for paragraph (g), Methods of Compliance, wet methods can be used in the great majority of workplace situations. Only in cases where asbestos work must be performed on live electrical equipment, on live steam lines, or in other areas where water will seriously damage materials or equipment may dry removal be performed. Amended water or another wetting agent should be applied by means of an airless sprayer to minimize the extent to which the asbestos-containing material is disturbed.

Asbestos-containing materials should be wetted from the initiation of the maintenance or renovation operation and wetting agents should be used continually throughout the work period to ensure that any dry asbestos-containing material exposed in the course of the work is wet and remains wet until final disposal.

Removal of Small Amount of Asbestos-Containing Materials

Several methods can be used to remove small amounts of asbestos-containing materials during small-scale, short-duration renovation or maintenance tasks. These include the use of glove bags, the removal of an entire asbestos-covered pipe or structure, and the construction of mini-enclosures. The procedures that employers must use for each of these operations if they wish to avail themselves of the final rule's exemptions are described in the following sections.

Glove Bags

As discussed in the Summary and Explanation section of the preamble for paragraph (g), Methods of Compliance, evidence in the record indicate that the use of glove bags to enclose the work area during small-scale, short-duration maintenance or renovation activities will result in employee exposures to asbestos that are below the final standard's action level of 0.1 f/cc. This appendix provides requirements for glove-bag procedures to be followed by employers wishing to avail themselves of the standard's exemptions for each activities. OSHA has determined that the use of these procedures will reduce the 8 hour time weighted average (TWA) exposures of employees involved in these work operations to levels below the action level and will thus provide a degree of employee protection equivalent to that provided by compliance with all provisions of the final rule.

Glove Bag Installation. Glove bags are approximately 40-inch-wide times 64-inch-long bags fitted with arms through which the work can be performed (see Figure G–1(A)). When properly installed and used, they permit workers to remain completely isolated from the asbestos material removed or replaced inside the bag. Glove bags can thus provide a flexibile, easily installed, and quickly dismantled temporary small work area enclosure that is ideal for small-scale asbestos renovation or maintenance jobs.

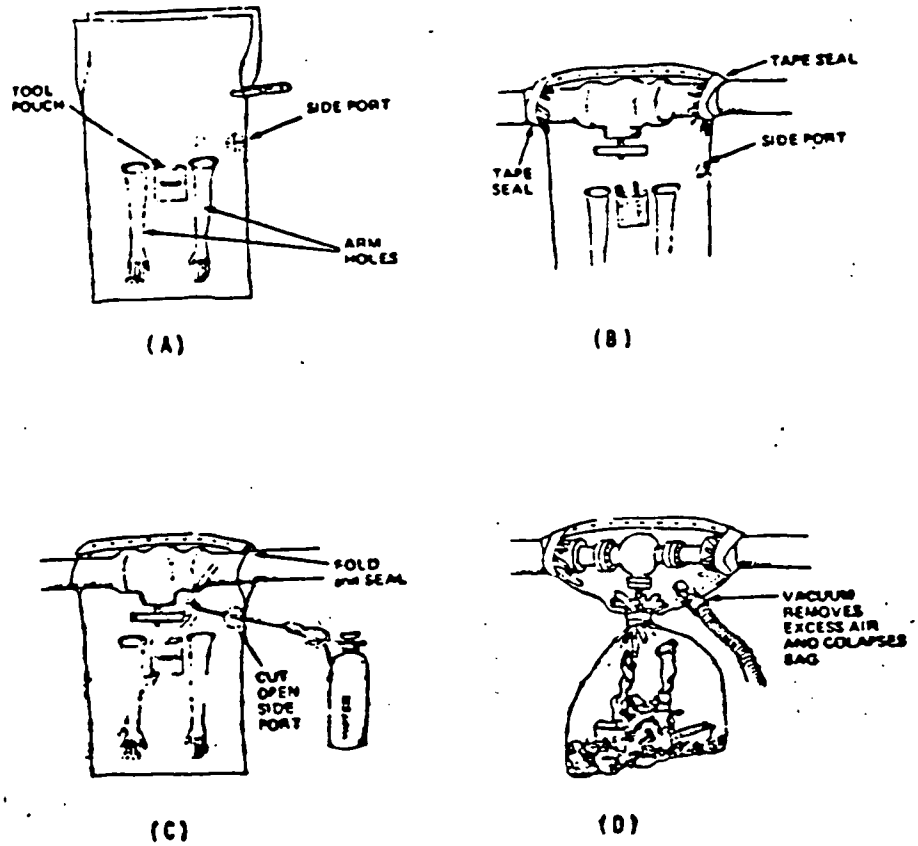

Figure G-1. Diagrams Showing Proper Use of Glove Bags in Small-Scale, Short-Duration Maintenance and Renovation Operations.

These bags are single use control devices that are disposed of at the end of each job. The bags are made of transparent 6-mil-thick polyethylene plastic with arms of Tyvek * material (the same material used to make the disposable protective suits used in major asbestos removal, renovation, and demolition operations and in protective gloves). Glove bags are readily available from safety supply stores or specialty asbestos removal supply houses. Glove bags come pre-labeled with the asbestos warning label prescribed by OSHA and EPA for bags used to dispose of asbestos waste.

Glove Bag Equipment and Supplies. Supplies and materials that are necessary to use glove bags effectively include:

(1) Tape to seal the glove bag to the area from which absbestos is to be removed;

(2) Amended water or other wetting agents;

(3) An airless sprayer for the application of the wetting agent;

(4) Bridging encapsulant (a paste-like substance for coating asbestos) to seal the rough edges of any asbestos-containing materials that remain within the glove bag at the points of attachment after the rest of the asbestos has be removed;

(5) Tools such as razor knives, nips, and wire brushes (or other tools suitable for cutting wire, etc.);

(6) A HEPA filter-equipped vacuum for evacuating the glove bag (to minimize the release of asbestos fibers) during removal of the bag from the work area and for cleaning any material that may have escaped during the installation of the glove bag; and

(7) HEPA-equipped dust cartridge respirators for use by the employees involved in the removal of asbestos with the glove bag.

Glove Bag Work Practices. The proper use of glove bags requires the following steps:

(1) Glove bags must be installed so that they completely cover the pipe or other structure where asbestos work is to be done. Glove bags are installed by cutting the sides of the glove bag to fit the size of the pipe from which asbestos is to be removed. The glove bag is attached to the pipe by folding the open edges together and securely sealing them with tape. All openings in the glove bag must be sealed with duct tape or equivalent material. The bottom seam of the glove bag must also be sealed with duct tape or equivalent to prevent any leakage from the bag that may result from a defect in the bottom seam (Figure G-1(B)).

(2) The employee who is performing the asbestos removal with the glove bag must don a half mask dual-cartridge HEPA-equipped respirator; respirators should be worn by employees who are in close contact with the glove bag and who may thus be exposed as a result of small gaps in the seams of the bag or holes punched through the bag by a razor knife or a piece of wire mesh.

(3) The removed asbestos material from the pipe or other surface that has fallen into the enclosed bag must be thoroughly wetted with a wetting agent (applied with an airless sprayer through the pre-cut port provided in most gloves bags or applied through a small hole cut in the bag) (Figure G-1(C)).

(4) Once the asbestos material has been thoroughly wetted, it can be removed from the pipe, beam or other surface. The choice of tool to use to remove the asbestos-containing material depends on the type of material to be removed. Asbestos-containing materials are generally covered with painted canvas and/or wire mesh. Painted canvas can be cut with a razor knife and peeled away from the asbestos-containing material underneath. Once the canvas has been peeled away, the asbestos-containing material underneath may be dry, in which case it should be re-sprayed with a wetting agent to ensure that it generates as little dust as possible when removed. If the asbestos-containing material is covered with wire mesh, the mesh should be cut with nips, tin snips, or other appropriate tool and removed.

A wetting agent must then be used to spray any layer of dry material that is exposed beneath the mesh, the surface of the stripped underlying structure, and the inside of the glove bag.

(5) After removal of the layer of asbestos-containing material, the pipe or surface from which asbestos has been removed must be thoroughly cleaned with a wire brush and wet wiped with a wetting agent until no traces of the asbestos containing material can be seen.

(6) Any asbestos containing insulation edges that have been exposed as a result of the removal or maintenance activity must be encapsulated with bridging encapsulant to ensure that the edges do not release asbestos fibers to the atmosphere after the glove bag has been removed.

(7) When the asbestos removal and encapsulation have been completed, a vacuum hose from a HEPA filtered vacuum must be inserted into the glove bag through the port to remove any air in the bag that may contain asbestos fibers. When the air has been removed from the bag, the bag should be squeezed tightly (as close to the top as possible), twisted, and sealed with tape, to keep the asbestos materials safely in the bottom of the bag. The HEPA vacuum can

* Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

then be removed from the bag and the glove bag itself can be removed from the work area to be disposed of properly (Figure C–1(D)).

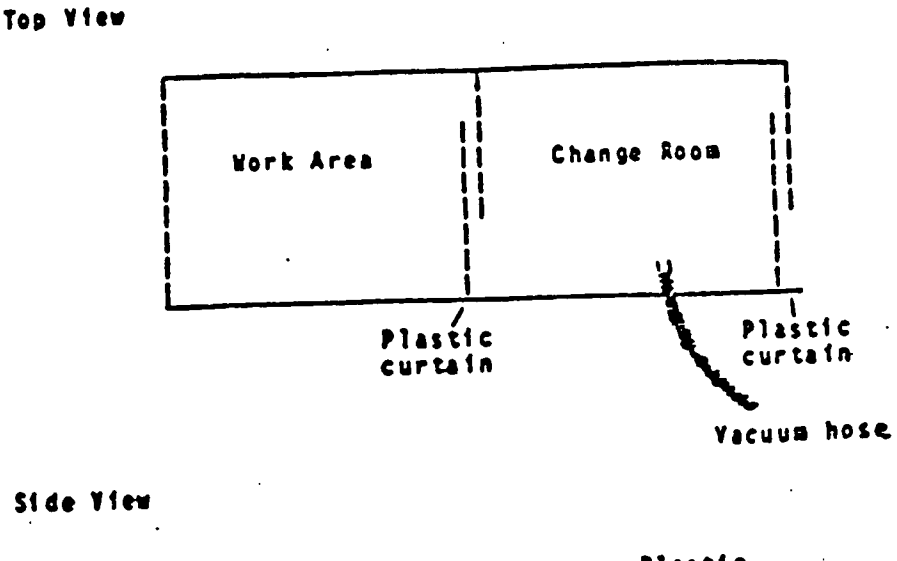

Figure C–2. Schematic of Mini-enclosure

Mini-Enclosures

In some instances, such as removal of asbestos from a small ventilation system or from a short length of duct, a glove bag may not be either large enough or of the proper shape to enclose the work area. In such cases, a mini-enclosure can be built around the area where small-scale, short-duration asbestos maintenance or renovation work is to be performed (Figure C–2). Such an enclosure should be constructed of 6-mil-thick polyethylene plastic sheeting and can be small enough to restrict entry to the asbestos work area to one worker.

For example, a mini-enclosure can be built in a small utility closet when asbestos-containing duct covering is to be removed. The enclosure is constructed by:

(1) Affixing plastic sheeting to the walls with spray adhesive and tape;

(2) Covering the floor with plastic and sealing the plastic covering the floor to the plastic on the walls.

(3) Sealing any penetrations such as pipes or electrical conduits with tape; and

(4) Constructing a small change room (approximately 3 feet square) made of 6-mil-thick polyethylene plastic supported by 2-inch by 4-inch lumber (the plastic should be attached to the lumber supports with staples or spray adhesive and tape).

The change room should be contiguous to the mini enclosure, and is necessary to allow the worker to vacuum off his protective coveralls and remove them before leaving the work area. While inside the enclosure, the worker should wear Tyvek[1] disposable coveralls and use the appropriate HEPA filtered dual cartridge respiratory protection.

The advantages of mini-enclosures are that they limit the spread of asbestos contamination, reduce the potential exposure of bystanders and other workers who may be working in adjacent areas, and are quick and easy to install. The disadvantage of mini-enclosures is that they may be too small to contain the equipment necessary to create a negative pressure within the enclosure; however, the double layer of plastic sheeting will serve to restrict the release of asbestos fibers to the area outside the enclosure.

Removal of Entire Structures

When pipes are insulated with asbestos-containing materials, removal of the entire pipe may be more protective, easier, and more cost-effective than stripping the asbestos insulation from the pipe. Before such a pipe is cut, the asbestos-containing insulation must be wrapped with 6-mil polyethylene plastic and securely sealed with duct tape or equivalent. This plastic covering will prevent asbestos fibers from becoming airborne as a result of the vibration created by the power saws used to cut the pipe. If possible, the pipes should be cut at locations that are not insulated to avoid disturbing the asbestos. If a pipe is completely insulated with asbestos-containing materials, small sections should be stripped using the glove-bag method described above before the pipe is cut at the stripped sections.

Enclosure

The decision to enclose rather than remove asbestos-containing material from an area depends on the building owner's preference, i.e., for removal or containment. Owners consider such factors as cost effectiveness, the physical configuration of the work area, and the amount of traffic in the area when determining which abatement method to use.

If the owner chooses to enclose the structure rather than to remove the asbestos-containing material insulating it, a solid structure (airtight walls and ceilings) must be built around the asbestos covered pipe or structure to prevent the release of asbestos-containing materials into the area beyond the enclosure and to prevent disturbing these

[1] Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

materials by casual contact during future maintenance operations.

Such a permanent (i.e., for the life of the building) enclosure should be built of new construction materials and should be impact resistant and airtight. Enclosure walls should be made of tongue-and-groove boards, boards with spine joints, or gypsum boards having taped seams. The underlying structure must be able to support the weight of the enclosure. (Suspended ceilings with laid in panels do not provide airtight enclosures and should not be used to enclose structures covered with asbestos-containing materials.) All joints between the walls and ceiling of the enclosure should be caulked to prevent the escape of asbestos fibers. During the installation of enclosures, tools that are used (such as drills or rivet tools) should be equipped with HEPA-filtered vacuums. Before constructing the enclosure, all electrical conduits, telephone lines, recessed lights, and pipes in the area to be enclosed should be moved to ensure that the enclosure will not have to be re-opened later for routine or emergency maintenance. If such lights or other equipment cannot be moved to a new location for logistic reasons, or if moving them will disturb the asbestos-containing materials, removal rather than enclosure of the asbestos-containing materials is the appropriate control method to use.

Maintenance Program

An asbestos maintenance program must be initiated in all facilities that have asbestos-containing materials. Such a program should include:

- Development of an inventory of all asbestos-containing materials in the facility;
- Periodic examination of all asbestos-containing materials to detect deterioration;
- Written procedures for handling asbestos materials during the performance of small-scale, short-duration maintenance and renovation activities;
- Written procedures for asbestos disposal; and
- Written procedures for dealing with asbestos-related emergencies.

Members of the building's maintenance engineering staff (electricians, heating/air conditioning engineers, plumbers, etc.) who may be required to handle asbestos-containing materials should be trained in safe procedures. Such training should include at a minimum:

- Information regarding types of asbestos and its various uses and forms;
- Information on the health effects associated with asbestos exposure;
- Descriptions of the proper methods of handling asbestos-containing materials; and
- Information on the use of HEPA-equipped dual cartridge respiratory and other personal protection during maintenance activities.

Prohibited Activities

The training program for the maintenance engineering staff should describe methods of handling asbestos-containing materials as well as routine maintenance activities that are prohibited when asbestos-containing materials are involved. For example, maintenance staff employees should be instructed:

- *Not* to drill holes in asbestos-containing materials;
- *Not* to hang plants or pictures on structures covered with asbestos-containing materials;
- *Not* to sand asbestos-containing floor tile;
- *Not* to damage asbestos-containing materials while moving furniture or other objects;
- *Not* to install curtains, drapes, or dividers in such a way that they damage asbestos-containing materials;
- *Not* to dust floors, ceilings, moldings or other surfaces in asbestos-contaminated environments with a dry brush or sweep with a dry broom;
- *Not* to use an ordinary vacuum to clean up asbestos-containing debris;
- *Not* to remove ceiling tiles below asbestos-containing materials without wearing the proper respiratory protection, clearing the area of other people, and observing asbestos removal waste disposal procedures;
- *Not* to remove ventilation system filters dry; and
- *Not* to shake ventilation system filters.

Appendix H to § 1926.58—Substance Technical Information for Asbestos, Non-Mandatory

I. Substance Identification

A. Substance: "Asbestos" is the name of a class of magnesium-silicate minerals that occur in fibrous form. Minerals that are included in this group are chrysotile, crocidolite, amosite, anthophyllite asbestos, tremolite asbestos, and actinolite asbestos.

B. Asbestos, tremolite, anthophyllite, and actinolite are used in the manufacture of heat-resistant clothing, automotive brake and clutch linings, and a variety of building materials including floor tiles, roofing felts, ceiling tiles, asbestos-cement pipe and sheet, and fire-resistant drywall. Asbestos, tremolite, anthophyllite and actinolite are also present in pipe and boiler insulation materials, and in sprayed-on materials located on beams, in crawlspaces, and between walls.

C. The potential for an asbestos-containing product to release breathable fibers depends on its degree of friability. Friable means that the material can be crumbled with hand pressure and is therefore likely to emit fibers. The fibrous or fluffy sprayed-on materials used for fireproofing, insulation, or sound proofing are considered to be friable, and they readily release airborne fibers if disturbed. Materials such as vinyl-asbestos floor tile or roofing felts are considered nonfriable and generally do not emit airborne fibers unless subjected to sanding or sawing operations. Asbestos-cement pipe or sheet can emit airborne fibers if the materials are cut or sawed, or if they are broken during demolition operations.

D. Permissible exposure: Exposure to airborne asbestos, tremolite, anthophyllite, and actinolite fibers may not exceed 0.2 fibers per cubic centimeter of air (0.2 f/cc) averaged over the 8-hour workday.

II. Health Hazard Data

A. Asbestos, tremolite, anthophyllite, and actinolite can cause disabling respiratory disease and various types of cancers if the fibers are inhaled. Inhaling or ingesting fibers from contaminated clothing or skin can also result in these diseases. The symptoms of these diseases generally do not appear for 20 or more years after initial exposure.

B. Exposure to asbestos, tremolite, anthophyllite and actinolite has been shown to cause lung cancer, mesothelioma, and cancer of the stomach and colon. Mesothelioma is a rare cancer of the thin membrane lining of the chest and abdomen. Symptoms of mesothelioma include shortness of breath, pain in the walls of the chest, and/or abdominal pain.

III. Respirators and Protective Clothing

A. Respirators: You are required to wear a respirator when performing tasks that result in asbestos, tremolite, anthophyllite and actinolite exposure that exceeds the permissible exposure limit (PEL) of 0.2 f/cc. These conditions can occur while your employer is in the process of installing engineering controls to reduce asbestos, tremolite, anthophyllite and actinolite exposure, or where engineering controls are not feasible to reduce asbestos, tremolite, anthophyllite and actinolite exposure. Air-purifying respirators equipped with a high-efficiency particulate air (HEPA) filter can be used where airborne asbestos, tremolite, anthophyllite and actinolite fiber concentrations do not exceed 2 f/cc; otherwise, air-supplied, positive-pressure, full facepiece respirators must be used. Disposable respirators or dust masks are not permitted to be used for asbestos, tremolite, anthophyllite and actinolite work. For effective protection, respirators must fit your face and head snugly. Your employer is required to conduct fit tests when you are first assigned a respirator and every 6 months thereafter. Respirators should not be loosened or removed in work situations where their use is required.

B. Protective Clothing: You are required to wear protective clothing in work areas where asbestos, tremolite, anthophyllite, and actinolite fiber concentrations exceed the permissible exposure limit (PEL) of 0.2 f/cc to prevent contamination of the skin. Where protective clothing is required, your employer must provide you with clean garments. Unless you are working on a large asbestos, tremolite, anthophyllite, and actinolite removal or demolition project, your employer must also provide a change room and separate lockers for your street clothes and contaminated work clothes. If you are working on a large asbestos, tremolite, anthophyllite, and actinolite removal or demolition project, and where it is feasible to do so, your employer must provide a clean room, shower, and decontamination room contiguous to the work area. When leaving the work area, you must remove contaminated clothing before proceeding to the shower. If the shower is not adjacent to the work area, you must vacuum your clothing before proceeding to change the room and shower. To prevent inhaling fibers in contaminated change rooms and showers, leave your respirator on until you leave the shower and enter the clean change room.

IV. Disposal Procedures and Cleanup

A. Wastes that are generated by processes where asbestos, tremolite, anthophyllite, and actinolite is present include:

1. Empty asbestos, tremolite, anthophyllite, and actinolite shipping containers.

2. Process wastes such as cuttings, trimmings, or reject materials.

3. Housekeeping waste from sweeping or vacuuming.

4. Asbestos fireproofing or insulating material that is removed from buildings.

5. Asbestos-containing building products removed during building renovation or demolition.

6. Contaminated disposable protective clothing.

B. Empty shipping bags can be flattened under exhaust hoods and packed into airtight containers for disposal. Empty shipping drums are difficult to clean and should be sealed.

C. Vacuum logs or disposable paper filters should not be cleaned, but should be sprayed with a fine water mist and placed into a labeled waste container.

D. Process waste and housekeeping waste should be wetted with water or a mixture of water and surfactant prior to packaging in disposable containers.

E. Asbestos-containing material that is removed from buildings must be disposed of in leak-tight 6-mil thick plastic bags, plastic-lined cardboard containers, or plastic-lined metal containers. These wastes, which are removed while wet, should be sealed in containers before they dry out to minimize the release of asbestos, tremolite, anthophyllite, and actinolite fibers during handling.

V. Access to Information

A. Each year, your employer is required to inform you of the information contained in this standard and appendices for asbestos. In addition, your employer must instruct you in the proper work practices for handling asbestos-containing materials, and the correct use of protective equipment.

B. Your employer is required to determine whether you are being exposed to asbestos. You or your representative has the right to observe employee measurements and to record the results obtained. Your employer is required to inform you of your exposure, and, if you are exposed above the permissible limit, he or she is required to inform you of the actions that are being taken to reduce your exposure to within the permissible limit.

C. Your employer is required to keep records of your exposures and medical examinations. These exposure records must be kept for at least thirty (30) years. Medical records must be kept for the period of your employment plus thirty (30) years.

D. Your employer is required to release your exposure and medical records to your physician or designated representative upon your written request.

Appendix I to § 1926.58—Medical Surveillance Guidelines for Asbestos, Tremolite, Anthophyllite, and Actinolite, Non-Mandatory

I. Route of Entry

Inhalation ingestion.

II. Toxicology

Clinical evidence of the adverse effects associated with exposure to asbestos, tremolite, anthophyllite, and actinolite, is present in the form of several well-conducted epidemiological studies of occupationally exposed workers, family contacts of workers, and persons living near asbestos, tremolite, anthophyllite, and actinolite mines. These studies have shown a definite association between exposure to asbestos, tremolite, anthophyllite, and actinolite and an increased incidence of lung cancer, pleural and peritoneal mesothelioma, gastrointestinal cancer, and asbestosis. The latter is a disabling fibrotic lung disease that is caused only by exposure to asbestos. Exposure to asbestos, tremolite, anthophyllite, and actinolite has also been associated with an increased incidence of esophageal, kidney, laryngeal, pharyngeal, and buccal cavity cancers. As with other known chronic occupational diseases, disease associated with asbestos, tremolite, anthophyllite, and actinolite generally appears about 20 years following the first occurrence of exposure: There are no known acute effects associated with exposure to asbestos, tremolite, anthophyllite, and actinolite.

Epidemiological studies indicate that the risk of lung cancer among exposed workers who smoke cigarettes is greatly increased over the risk of lung cancer among non-exposed smokers or exposed nonsmokers. These studies suggest that cessation of smoking will reduce the risk of lung cancer for a person exposed to asbestos, tremolite, anthophyllite, and actinolite but will not reduce it to the same level of risk as that existing for an exposed worker who has never smoked.

III. Signs and Symptoms of Exposure-Related Disease

The signs and symptoms of lung cancer or gastrointestinal cancer induced by exposure to asbestos, tremolite, anthophyllite, and actinolite are not unique, except that a chest X-ray of an exposed patient with lung cancer may show pleural plaques, pleural calcification, or pleural fibrosis. Symptoms characteristic of mesothelioma include shortness of breath, pain in the walls of the chest, or abdominal pain. Mesothelioma has a much longer latency period compared with lung cancer (40 years versus 15–20 years), and mesothelioma is therefore more likely to be found among workers who were first exposed to asbestos at an early age. Mesothelioma is always fatal.

Asbestosis is pulmonary fibrosis caused by the accumulation of asbestos fibers in the lungs. Symptoms include shortness of breath, coughing, fatigue, and vague feelings of sickness. When the fibrosis worsens, shortness of breath occurs even at rest. The diagnosis of asbestosis is based on a history of exposure to asbestos, the presence of characteristics radiologic changes, end-inspiratory crackles (rales), and other clinical features of fibrosing lung disease. Pleural plaques and thickening are observed on X-rays taken during the early stages of the disease. Asbestosis is often a progressive disease even in the absence of continued exposure, although this appears to be a highly individualized characteristic. In severe cases, death may be caused by respiratory or cardiac failure.

IV. Surveillance and Preventive Considerations

As noted above, exposure to asbestos, tremolite, anthophyllite, and actinolite has been linked to an increased risk of lung cancer, mesothelioma, gastrointestinal cancer, and asbestosis among occupationally exposed workers. Adequate screening tests to determine an employee's potential for developing serious chronic diseases, such as a cancer, from exposure to asbestos, tremolite, anthophyllite, and actinolite do not presently exist. However, some tests, particularly chest X-rays and pulmonary function tests, may indicate that an employee has been overexposed to asbestos, tremolite, anthophyllite, and actinolite, increasing his or her risk of developing exposure related chronic diseases. It is important for the physician to become familiar with the operating conditions in which occupational exposure to asbestos, tremolite, anthophyllite, and actinolite is likely to occur. This is particularly important in evaluating medical and work histories and in conducting physical examinations. When an active employee has been identified as having been overexposed to asbestos, tremolite, anthophyllite, and actinolite, measures taken by the employer to eliminate or mitigate further exposure should also lower the risk of serious long-term consequences.

The employer is required to institute a medical surveillance program for all employees who are or will be exposed to asbestos, tremolite, anthophyllite, and actinolite at or above the action level (0.1 fiber per cubic centimeter of air) for 30 or more days per year and for all employees who are assigned to wear a negative-pressure respirator. All examinations and procedures must be performed by or under the supervision of a licensed physician, at a reasonable time and place, and at no cost to the employee.

Although broad latitude is given to the physician in prescribing specific tests to be included in the medical surveillance program, OSHA requires inclusion of the following elements in the routine examination:

(i) Medical and work histories with special emphasis directed to symptoms of the respiratory system, cardiovascular system, and digestive tract.

(ii) Completion of the respiratory disease questionnaire contained in Appendix D.

(iii) A physical examination including a chest roentgenogram and pulmonary function test that includes measurement of the employee's forced vital capacity (FVC) and forced expiratory volume at one second (FEV_1).

(iv) Any laboratory or other test that the examining physician deems by sound medical practice to be necessary.

The employer is required to make the prescribed tests available at least annually to those employees covered; more often than specified if recommended by the examining physician; and upon termination of employment.

The employer is required to provide the physician with the following information: A copy of this standard and appendices; a description of the employee's duties as they relate to asbestos exposure; the employee's representative level of exposure to asbestos, tremolite, anthophyllite, and actinolite; a description of any personal protective and respiratory equipment used; and information from previous medical examinations of the affected employee that is not otherwise available to the physician. Making this information available to the physician will aid in the evaluation of the employee's health in relation to assigned duties and fitness to wear personal protective equipment, if required.

The employer is required to obtain a written opinion from the examining physician containing the results of the medical examination; the physician's opinion as to whether the employee has any detected medical conditions that would place the employee at an increased risk of exposure-related disease; any recommended limitations on the employee or on the use of personal protective equipment; and a statement that the employee has been informed by the physician of the results of the medical examination and of any medical conditions related to asbestos, tremolite, anthophyllite, and actinolite exposure that require further explanation or treatment. This written opinion must not reveal specific findings or diagnoses unrelated to exposure to asbestos, tremolite, anthophyllite, and actinolite, and a copy of the opinion must be provided to the affected employee.

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Appendix D. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY NATIONAL EMMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAPS)
ASBESTOS REGULATIONS

USEPA National Emission Standards for Hazardous Air Pollutants (NESHAPS) Asbestos Regulations

AUTHORITY: Secs. 112 and 301(a) of the Clean Air Act, as amended (42 U.S.C. 7412, 7601(a)).

SOURCE: 49 FR 13661, Apr. 5, 1984, unless otherwise noted.

§ 61.140 Applicability.

The provisions of this subpart are applicable to those sources specified in §§ 61.142 through 61.153.

§ 61.141 Definitions.

All terms that are used in this subpart and are not defined below are given the same meaning as in the Act and in Subpart A of this part.

Active waste disposal site means any disposal site other than an inactive site.

Adequately wetted means sufficiently mixed or coated with water or an aqueous solution to prevent dust emissions.

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

Asbestos-containing waste materials means any waste that contains commercial asbestos and is generated by a source subject to the provisions of this subpart. This term includes asbestos mill tailings, asbestos waste from control devices, friable asbestos waste material, and bags or containers that previously contained commercial asbestos. However, as applied to demolition and renovation operations, this term includes only friable asbestos waste and asbestos waste from control devices.

Asbestos material means asbestos or any material containing asbestos.

Asbestos mill means any facility engaged in converting, or in any intermediate step in converting, asbestos ore into commercial asbestos. Outside storage of asbestos material is not considered a part of the asbestos mill.

Asbestos tailings means any solid waste that contains asbestos and is a product of asbestos mining or milling operations.

Asbestos waste from control devices means any waste material that contains asbestos and is collected by a pollution control device.

Commercial asbestos means any asbestos that is extracted from asbestos ore.

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

Emergency renovation operation means a renovation operation that was not planned but results from a sudden, unexpected event. This term includes operations necessitated by nonroutine failures of equipment.

Fabricating means any processing of a manufactured product that contains commercial asbestos, with the exception of processing at temporary sites for the construction or restoration of facilities.

Facility means any institutional, commercial, or industrial structure, installation, or building (excluding apartment buildings having no more than four dwelling units).

Facility component means any pipe, duct, boiler, tank, reactor, turbine, or furnace at or in a facility; or any structural member of a facility.

Friable asbestos material means any material containing more than 1 percent asbestos by weight that hand pressure can crumble, pulverize, or reduce to powder when dry.

Inactive waste disposal site means any disposal site or portion of it where additional asbestos-containing waste material will not be deposited and where the surface is not disturbed by vehicular traffic.

Manufacturing means the combining of commercial asbestos—or, in the case of woven friction products, the combining of textiles containing commercial asbestos—with any other material(s), including commercial asbestos, and the processing of this combination into a product.

Outside air means the air outside buildings and structures.

Particulate asbestos material means finely divided particles of asbestos material.

Planned renovation operations means a renovation operation, or a number of such operations, in which the amount of friable asbestos material that will be removed or stripped within a given period of time can be predicted. Individual nonscheduled operations are included if a number of such operations can be predicted to occur during a given period of time based on operating experience.

Remove means to take out friable asbestos materials from any facility.

Renovation means altering in any way one or more facility components. Operations in which load-supporting structural members are wrecked or taken out are excluded.

Roadways means surfaces on which motor vehicles travel. This term includes highways, roads, streets, parking areas, and driveways.

Strip means to take off friable asbestos materials from any part of a facility.

Structural member means any load-supporting member of a facility, such as beams and load supporting walls; or any nonload-supporting member, such as ceilings and nonload-supporting walls.

Visible emissions means any emissions containing particulate asbestos material that are visually detectable without the aid of instruments. This does not include condensed uncombined water vapor.

[49 FR 13661, Apr. 5, 1984; 49 FR 25453, June 21, 1984]

§ 61.142 Standard for asbestos mills.

Each owner or operator of an asbestos mill shall either discharge no visible emissions to the outside air from that asbestos mill or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.

§ 61.143 Standard for roadways.

No person may surface a roadway with asbestos tailings or asbestos-containing waste material on that roadway, unless it is a temporary roadway on an area of asbestos ore deposits.

[49 FR 13661, Apr. 5, 1984; 49 FR 25453, June 21, 1984]

§ 61.144 Standard for manufacturing.

(a) *Applicability.* This section applies to the following manufacturing operations using commercial asbestos.

(1) The manufacture of cloth, cord, wicks, tubing, tape, twine, rope, thread, yarn, roving, lap, or other textile materials.

(2) The manufacture of cement products.

(3) The manufacture of fireproofing and insulating materials.

(4) The manufacture of friction products.

(5) The manufacture of paper, millboard, and felt.

(6) The manufacture of floor tile.

(7) The manufacture of paints, coatings, caulks, adhesives, and sealants.

(8) The manufacture of plastics and rubber materials.

(9) The manufacture of chlorine.

(10) The manufacture of shotgun shell wads.

(11) The manufacture of asphalt concrete.

(b) *Standard.* Each owner or operator of any of the manufacturing operations to which this section applies shall either:

(1) Discharge no visible emissions to the outside air from these operations or from any building or structure in which they are conducted; or

(2) Use the methods specified by § 61.154 to clean emissions from these operations containing particulate asbestos material before they escape to, or are vented to, the outside air.

§ 61.145 Standard for demolition and renovation: Applicability.

The requirements of §§ 61.146 and 61.147 apply to each owner or operator

of a demolition or renovation operation as follows:

(a) If the amount of friable asbestos materials in a facility being demolished is at least 80 linear meters (260 linear feet) on pipes or at least 15 square meters (160 square feet) on other facility components, all the requirements of §§ 61.146 and 61.147 apply, except as provided in paragraph (c) of this section.

(b) If the amount of friable asbestos materials in a facility being demolished is less than 80 linear meters (260 linear feet) on pipes and less than 15 square meters (160 square feet) on other facility components, only the requirements of paragraphs (a), (b), and (c) (1), (2), (3), (4), and (5) of § 61.146 apply.

(c) If the facility is being demolished under an order of a State or local governmental agency, issued because the facility is structurally unsound and in danger of imminent collapse, only the requirements in § 61.146 and in paragraphs (d), (e), (f), and (g) of § 61.147 apply.

(d) If at least 80 linear meters (260 linear feet) of friable asbestos materials on pipes or at least 15 square meters (160 square feet) of friable asbestos materials on other facility components are stripped or removed at a facility being renovated, all the requirements of §§ 61.146 and 61.147 apply.

(1) To determine whether paragraph (d) of this section applies to planned renovation operations involving individual nonscheduled operations, predict the additive amount of friable asbestos materials to be removed or stripped over the maximum period of time a prediction can be made, not to exceed 1 year.

(2) To determine whether paragraph (d) of this section applies to emergency renovation operations, estimate the amount of friable asbestos materials to be removed or stripped as a result of the sudden, unexpected event that necessitated the renovation.

(e) Owners or operators of demolition and renovation operations are exempt from the requirements of §§ 61.05(a), 61.07, and 61.09.

[49 FR 13661, Apr. 5, 1984; 49 FR 25453, June 21, 1984]

§ 61.146 Standard for demolition and renovation: Notification requirements.

Each owner or operator to which this section applies shall:

(a) Provide the Administrator with written notice of intention to demolish or renovate.

(b) Postmark or deliver the notice as follows:

(1) At least 10 days before demolition begins if the operation is described in § 61.145(a);

(2) At least 20 days before demolition begins if the operation is described in § 61.145(b);

(3) As early as possible before demolition begins if the operation is described in § 61.145(c);

(4) As early as possible before renovation begins.

(c) Include the following information in the notice:

(1) Name and address of owner or operator.

(2) Description of the facility being demolished or renovated, including the size, age, and prior use of the facility.

(3) Estimate of the approximate amount of friable asbestos material present in the facility in terms of linear feet of pipe, and surface area on other facility components. For facilities described in § 61.145(b), explain techniques of estimation.

(4) Location of the facility being demolished or renovated.

(5) Scheduled starting and completion dates of demolition or renovation.

(6) Nature of planned demolition or renovation and method(s) to be used.

(7) Procedures to be used to comply with the requirements of this Subpart.

(8) Name and location of the waste disposal site where the friable asbestos waste material will be deposited.

(9) For facilities described in § 61.145(c), the name, title, and authority of the State or local governmental representative who has ordered the demolition.

(Approved by the Office of Management and Budget under control number 2060-0264.)

[49 FR 13661, Apr. 5, 1984; 49 FR 25453, June 21, 1984]

§ 61.147 Standard for demolition and renovation: Procedures for asbestos emission control.

Each owner or operator to whom this section applies shall comply with the following procedures to prevent emissions of particulate asbestos material to the outside air:

(a) Remove friable asbestos materials from a facility being demolished or renovated before any wrecking or dismantling that would break up the materials or preclude access to the materials for subsequent removal. However, friable asbestos materials need not be removed before demolition if:

(1) They are on a facility component that is encased in concrete or other similar material; and

(2) These materials are adequately wetted whenever exposed during demolition.

(b) When a facility component covered or coated with friable asbestos materials is being taken out of the facility as units or in sections:

(1) Adequately wet any friable asbestos materials exposed during cutting or disjointing operations; and

(2) Carefully lower the units or sections to ground level, not dropping them or throwing them.

(c) Adequately wet friable asbestos materials when they are being stripped from facility components before the members are removed from the facility. In renovation operations, wetting that would unavoidably damage equipment is not required if the owner or operator:

(1) Asks the Administrator to determine whether wetting to comply with this paragraph would unavoidably damage equipment, and, before beginning to strip, supplies the Administrator with adequate information to make this determination; and

(2) When the Administrator does determine that equipment damage would be unavoidable, uses a local exhaust ventilation and collection system designed and operated to capture the particulate asbestos material produced by the stripping and removal of the friable asbestos materials. The system must exhibit no visible emissions to the outside air or be designed and operated in accordance with the requirements in § 61.154.

(d) After a facility component has been taken out of the facility as units or in sections, either:

(1) Adequately wet friable asbestos materials during stripping; or

(2) Use a local exhaust ventilation and collection system designed and operated to capture the particulate asbestos material produced by the stripping. The system must exhibit no visible emissions to the outside air or be designed and operated in accordance with the requirements in § 61.154.

(e) For friable asbestos materials that have been removed or stripped:

(1) Adequately wet the materials to ensure that they remain wet until they are collected for disposal in accordance with § 61.152; and

(2) Carefully lower the materials to the ground or a lower floor, not dropping or throwing them; and

(3) Transport the materials to the ground via dust-tight chutes or containers if they have been removed or stripped more than 50 feet above ground level and were not removed as units or in sections.

(f) When the temperature at the point of wetting is below 0°C (32°F):

(1) Comply with the requirements of paragraphs (d) and (e) of this section. The owner or operator need not comply with the other wetting requirements in this section; and

(2) Remove facility components coated or covered with friable asbestos materials as units or in sections to the maximum extent possible.

(g) For facilities described in § 61.145(c), adequately wet the portion of the facility that contains friable asbestos materials during the wrecking operation.

§ 61.148 Standard for spraying.

The owner or operator of an operation in which asbestos-containing materials are spray applied shall comply with the following requirements:

(a) Use materials that contain 1 percent asbestos or less on a dry weight basis for spray-on application on buildings, structures, pipes, and conduits, except as provided in paragraph (c) of this section.

(b) For spray-on application of materials that contain more than 1 percent

asbestos on a dry weight basis on equipment and machinery, except as provided in paragraph (c) of this section:

(1) Notify the Administrator at least 20 days before beginning the spraying operation. Include the following information in the notice:

(i) Name and address of owner or operator.

(ii) Location of spraying operation.

(iii) Procedures to be followed to meet the requirements of this paragraph.

(2) Discharge no visible emissions to the outside air from the spray-on application of the asbestos-containing material or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.

(c) The requirements of paragraphs (a) and (b) of this section do not apply to the spray-on application of materials where the asbestos fibers in the materials are encapsulated with a bituminous or resinous binder during spraying and the materials are not friable after drying.

(d) Owners and operators of sources subject to this section are exempt from the requirements of §§ 61.05(a), 61.07, and 61.09.

(Approved by the Office of Management and Budget under control number 2000-0264.)

§ 61.149 Standard for fabricating.

(a) *Applicability.* This section applies to the following fabricating operations using commercial asbestos:

(1) The fabrication of cement building products.

(2) The fabrication of friction products, except those operations that primarily install asbestos friction materials on motor vehicles.

(3) The fabrication of cement or silicate board for ventilation hoods; ovens; electrical panels; laboratory furniture, bulkheads, partitions, and ceilings for marine construction; and flow control devices for the molten metal industry.

(b) *Standard.* Each owner or operator of any of the fabricating operations to which this section applies shall either:

(1) Discharge no visible emissions to the outside air from any of the operations or from any building or structure in which they are conducted; or

(2) Use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.

§ 61.150 Standard for insulating materials.

After the effective date of this regulation, no owner or operator of a facility may install or reinstall on a facility component any insulating materials that contain commercial asbestos if the materials are either molded and friable or wet-applied and friable after drying. The provisions of this paragraph do not apply to spray-applied insulating materials regulated under § 61.148.

§ 61.151 Standard for waste disposal for asbestos mills.

Each owner or operator of any source covered under the provisions of § 61.142 shall:

(a) Deposit all asbestos-containing waste material at waste disposal sites operated in accordance with the provisions of § 61.156; and

(b) Discharge no visible emissions to the outside air from the transfer of asbestos waste from control devices to the tailings conveyor, or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air. Dispose of the asbestos waste from control devices in accordance with § 61.152(b) or paragraph (c) of this section; and

(c) Discharge no visible emissions to the outside air during the collection, processing, packaging, transporting, or deposition of any asbestos-containing waste material, or use one of the disposal methods specified in paragraphs (c) (1) or (2) of this section, as follows:

(1) Use a wetting agent as follows:

(i) Adequately mix all asbestos-containing waste material with a wetting agent recommended by the manufacturer of the agent to effectively wet dust and tailings, before depositing the material at a waste disposal site. Use the agent as recommended for the

particular dust by the manufacturer of the agent.

(ii) Discharge no visible emissions to the outside air from the wetting operation or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.

(iii) Wetting may be suspended when the ambient temperature at the waste disposal site is less than −9.5°C (15°F). Determine the ambient air temperature by an appropriate measurement method with an accuracy of ±1°C(±2°F), and record it at least hourly while the wetting operation is suspended. Keep the records for at least 2 years in a form suitable for inspection.

(2) Use an alternative disposal method that has received prior approval by the Administrator.

§ 61.152 Standard for waste disposal for manufacturing demolition, renovation, spraying, and fabricating operations.

Each owner or operator of any source covered under the provisions of §§ 61.144 and 61.149 shall:

(a) Deposit all asbestos-containing waste material at waste disposal sites operated in accordance with the provisions of § 61.156; and

(b) Discharge no visible emissions to the outside air during the collection, processing (including incineration), packaging, transporting, or deposition of any asbestos-containing waste material generated by the source, or use one of the disposal methods specified in paragraphs (b)(1), (2), or (3) of this section, as follows:

(1) Treat asbestos-containing waste material with water:

(i) Mix asbestos waste from control devices with water to form a slurry; adequately wet other asbestos-containing waste material; and

(ii) Discharge no visible emissions to the outside air from collection, mixing, and wetting operations, or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air; and

(iii) After wetting, seal all asbestos-containing waste material in leak-tight containers while wet; and

(iv) Label the containers specified in paragraph (b)(1)(iii) as follows:

CAUTION

Contains Asbestos
Avoid Opening or
Breaking Container
Breathing Asbestos is Hazardous
to Your Health

Alternatively, use warning labels specified by Occupational Safety and Health Standards of the Department of Labor, Occupational Safety and Health Administration (OSHA) under 29 CFR 1910.1001(g)(2)(ii).

(2) Process asbestos-containing waste material into nonfriable forms:

(i) Form all asbestos-containing waste material into nonfriable pellets or other shapes; and

(ii) Discharge no visible emissions to the outside air from collection and processing operations, or use the methods specified by § 61.154 to clean emissions containing particulate asbestos material before they escape to, or are vented to, the outside air.

(3) Use an alternative disposal method that has received prior approval by the Administrator.

[49 FR 13661, Apr. 5, 1984; 49 FR 25453, June 21, 1984]

§ 61.153 Standard for inactive waste disposal sites for asbestos mills and manufacturing and fabricating operations.

Each owner or operator of any inactive waste disposal site that was operated by sources covered under § 61.142, § 61.144, or § 61.149 and received deposits of asbestos-containing waste material generated by the sources, shall

(a) Comply with one of the following:

(1) Either discharge no visible emissions to the outside air from an inactive waste disposal site subject to this paragraph; or

(2) Cover the asbestos-containing waste material with at least 15 centimeters (6 inches) of compacted nonasbestos-containing material, and grow and maintain a cover of vegetation on

the area adequate to prevent exposure of the asbestos-containing waste material; or

(3) Cover the asbestos-containing waste material with at least 60 centimeters (2 feet) of compacted nonasbestos-containing material, and maintain it to prevent exposure of the asbestos-containing waste; or

(4) For inactive waste disposal sites for asbestos tailings, apply a resinous or petroleum-based dust suppression agent that effectively binds dust and controls wind erosion. Use the agent as recommended for the particular asbestos tailings by the manufacturer of the dust suppression agent. Obtain prior approval of the Administrator to use other equally effective dust suppression agents. For purposes of this paragraph, waste crankcase oil is not considered a dust suppression agent.

(b) Unless a natural barrier adequately deters access by the general public, install and maintain warning signs and fencing as follows, or comply with paragraph (a)(2) or (a)(3) of this section.

(1) Display warning signs at all entrances and at intervals of 100 m (330 feet) or less along the property line of the site or along the perimeter of the sections of the site where asbestos-containing waste material was deposited. The warning signs must:

(i) Be posted in such a manner and location that a person can easily read the legend; and

(ii) Conform to the requirements for 51 cm×36 cm (20"×14") upright format signs specified in 29 CFR 1910.145(d)(4) and this paragraph; and

(iii) Display the following legend in the lower panel with letter sizes and styles of a visibility at least equal to those specified in this paragraph.

Legend	Notation
Asbestos Waste Disposal Site	2.5 cm (1 inch) Sans Serif, Gothic or Block
Do Not Create Dust	1.9 cm (¾ inch) Sans Serif, Gothic or Block
Breathing Asbestos is Hazardous to Your Health	14 Point Gothic

Spacing between any two lines must be at least equal to the height of the upper of the two lines.

(2) Fence the perimeter of the site in a manner adequate to deter access by the general public.

(3) Upon request and supply of appropriate information, the Administrator will determine whether a fence or a natural barrier adequately deters access by the general public.

(c) The owner or operator may use an alternative control method that has received prior approval of the Administrator rather than comply with the requirements of paragraph (a) or (b) of this section.

§ 61.154 Air-cleaning.

(a) The owner or operator who elects to use air-cleaning, as permitted by §§ 61.142, 61.144, 61.147(c)(2), 61.147(d)(2), 61.148(b)(2), 61.149(b), 61.151(b), 61.151(c)(1)(ii), 61.152(b)(1)(ii), and 61.152(b)(2) shall:

(1) Use fabric filter collection devices, except as noted in paragraph (b) of this section, doing all of the following:

(i) Operating the fabric filter collection devices at a pressure drop of no more than .995 kilopascal (4 inches water gage), as measured across the filter fabric; and

(ii) Ensuring that the airflow permeability, as determined by ASTM Method D737-75, does not exceed 9 $m^3/min/m^2$ (30 $ft^3/min/ft^2$) for woven fabrics or 11 $m^3/min/m^2$ (35 $ft^3/min/ft^2$) for felted fabrics, except that 12 $m^3/min/m^2$ (40 $ft^3/min/ft^2$) for woven and 14 $m^3/min/m^2$ (45 $ft^3/min/ft^2$) for felted fabrics is allowed for filtering air from asbestos ore dryers; and

(iii) Ensuring that felted fabric weighs at least 475 grams per square meter (14 ounces per square yard) and is at least 1.6 millimeters (one-sixteenth inch) thick throughout; and

(iv) Avoiding the use of synthetic fabrics that contain fill yarn other than that which is spun.

(2) Properly install, use, operate, and maintain all air-cleaning equipment authorized by this section. Bypass devices may be used only during upset or emergency conditions and then only for so long as it takes to shut down the operation generating the particulate asbestos material.

format signs specified in 29 CFR 1910.145(d)(4) and this paragraph; and

(iii) Display the following legend in the lower panel with letter sizes and styles of a visibility at least equal to those specified in this paragraph.

Legend	Notation
Asbestos Waste Disposal Site	2.5 cm (1 inch) Sans Serif, Gothic or Block
Do Not Create Dust	1.9 cm (¾ inch) Sans Serif, Gothic or Block.
Breathing Asbestos is Hazardous to Your Health	14 Point Gothic.

Spacing between any two lines must be at least equal to the height of the upper of the two lines.

(2) The perimeter of the disposal site must be fenced in a manner adequate to deter access by the general public.

(3) Upon request and supply of appropriate information, the Administrator will determine whether a fence or a natural barrier adequately deters access by the general public.

(c) Rather than meet the no visible emission requirement of paragraph (a) of this section, an active waste disposal site would be an acceptable site if at the end of each operating day, or at least once every 24-hour period while the site is in continuous operation, the asbestos-containing waste material which was deposited at the site during the operating day or previous 24-hour period is covered with either.

(1) At least 15 centimeters (6 inches) of compacted nonasbestos-containing material, or

(2) A resinous or petroleum-based dust suppression agent that effectively binds dust and controls wind erosion. This agent must be used as recommended for the particular dust by the manufacturer of the dust suppression agent. Other equally effective dust suppression agents may be used upon prior approval by the Administrator. For purposes of this paragraph, waste crankcase oil is not considered a dust suppression agent.

(d) Rather than meet the no visible emission requirement of paragraph (a) of this section, an active waste disposal site would be an acceptable site if an alternative control method for emissions that has received prior approval by the Administrator is used.

(Secs. 112 and 301(a) of the Clean Air Act as amended (42 U.S.C. 7412, 7601(a))

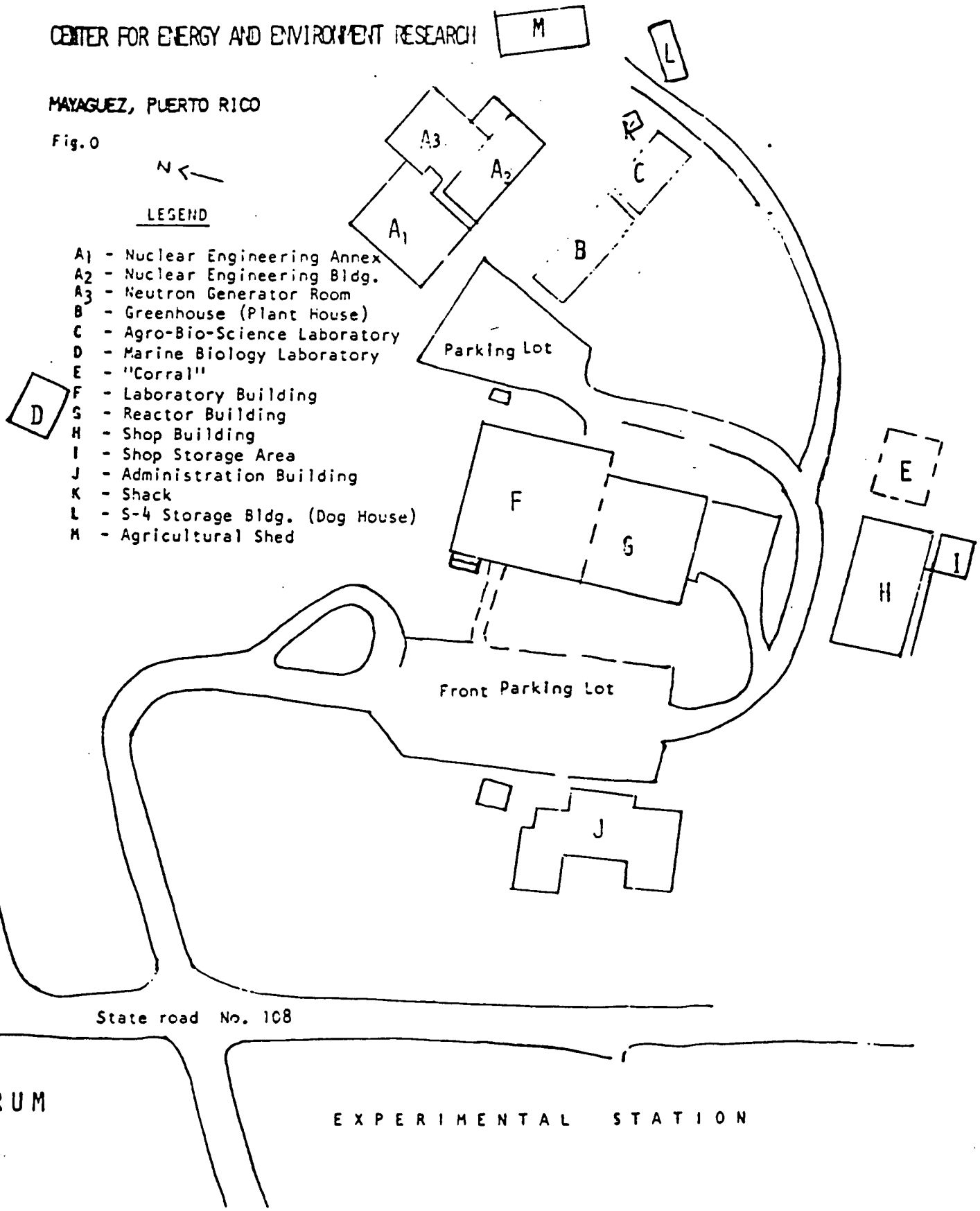
	DEMOLITION		RENOVATION	
AMOUNT	$\geq$ 260ft or $\geq$ 160ft^2	$\leq$ 260ft + $\geq$ 160ft^2	$\geq$ 260ft or $\geq$ 160ft^2	$<$ 260ft + $\geq$ 160ft^2
NOTIFICATION	YES	YES (MODIFIED)	YES	NO
HOW FAR IN ADVANCE	10 DAYS	20 DAYS	EARLY AS POSSIBLE BEFORE	
EMISSION CONTROLS	YES	NO	YES	NO
DISPOSAL STANDARD	YES	*NO	YES	*NO
*REGULATION VAGUE EPA SAYS "NO"				

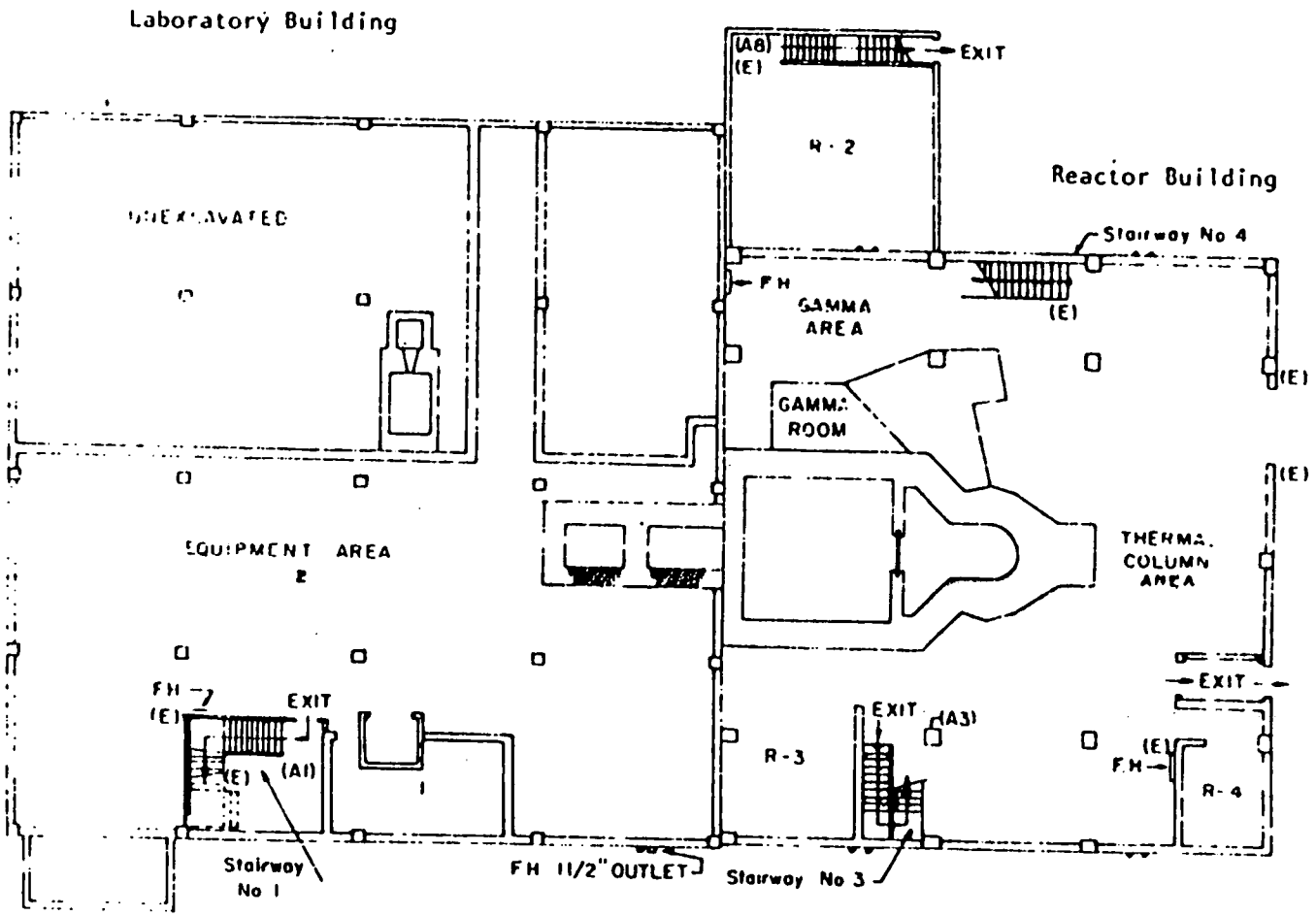
Appendix E. DRAWINGS AND PHOTOGRAPHS

CENTER FOR ENERGY AND ENVIRONMENT RESEARCH

MAYAGUEZ, PUERTO RICO

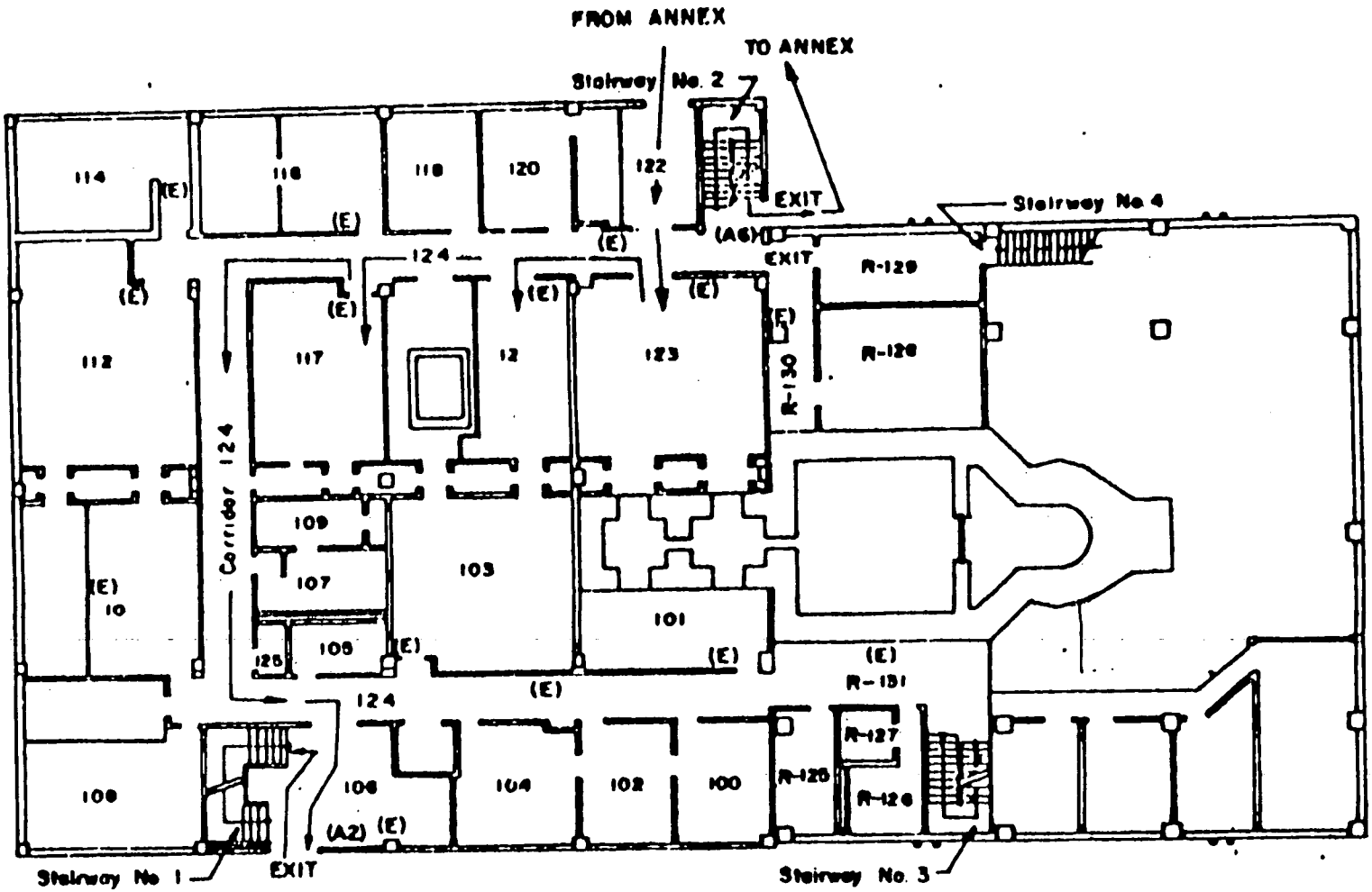
Fig. 0



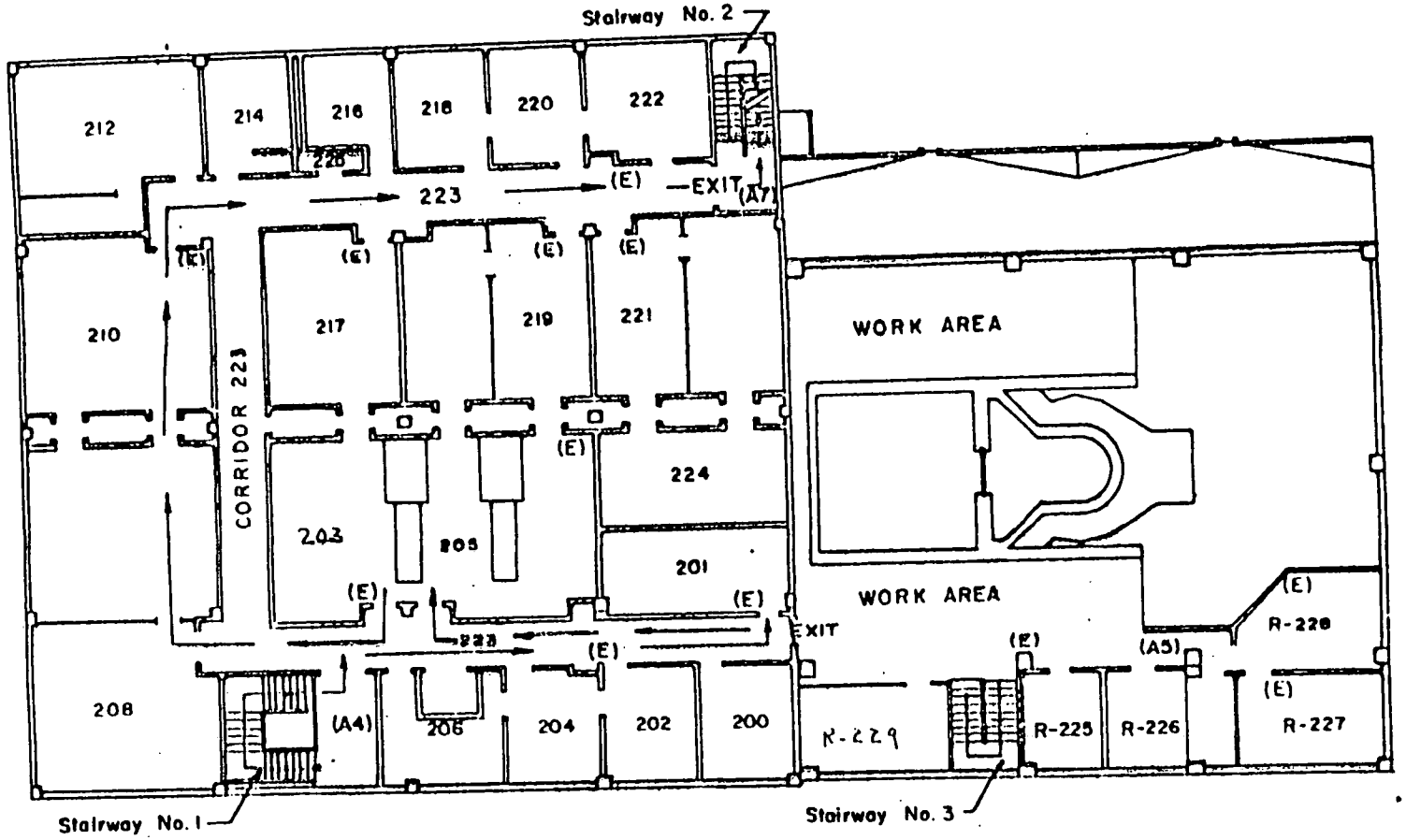


BASEMENT FLOOR

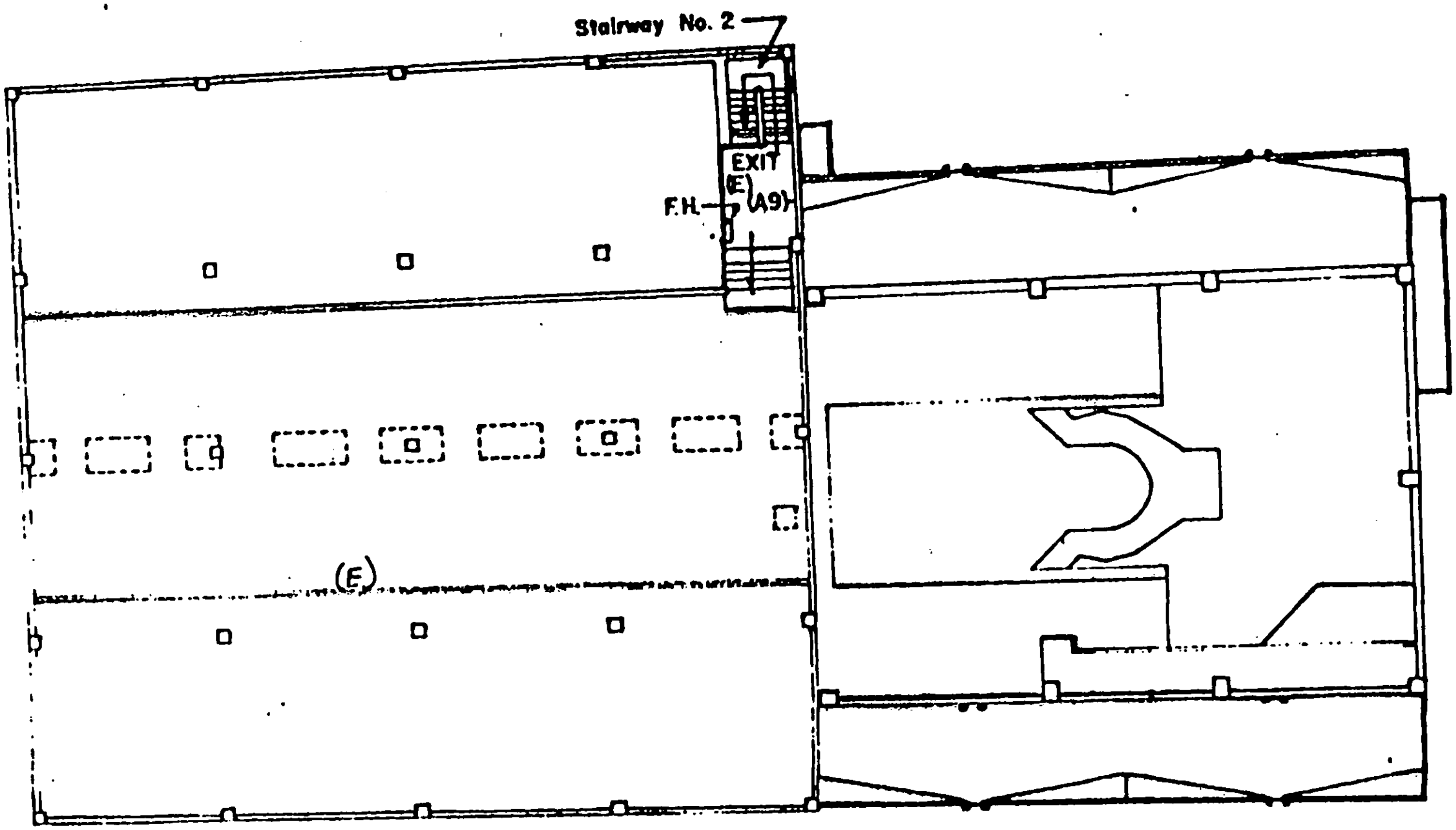
FIG.



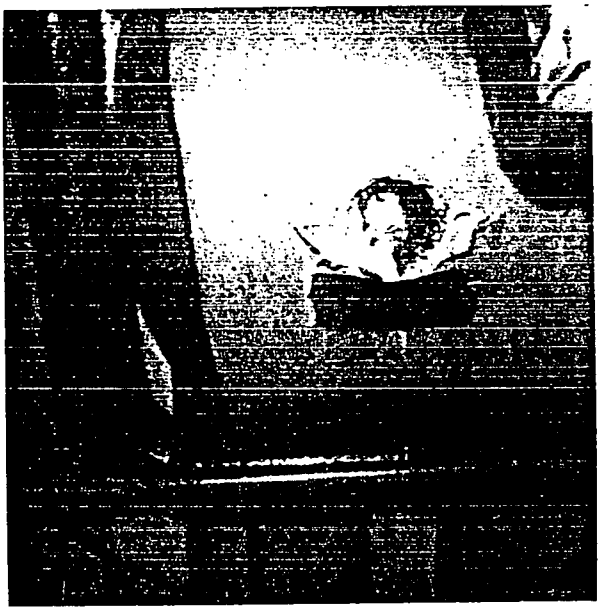
GROUND FLOOR



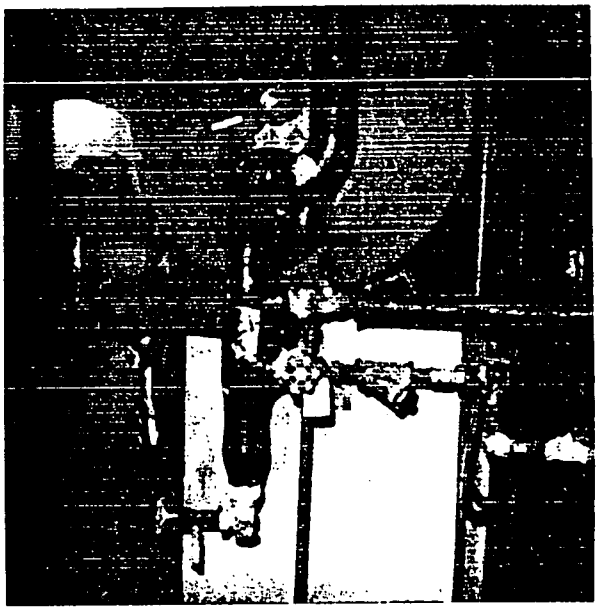
SECOND FLOOR



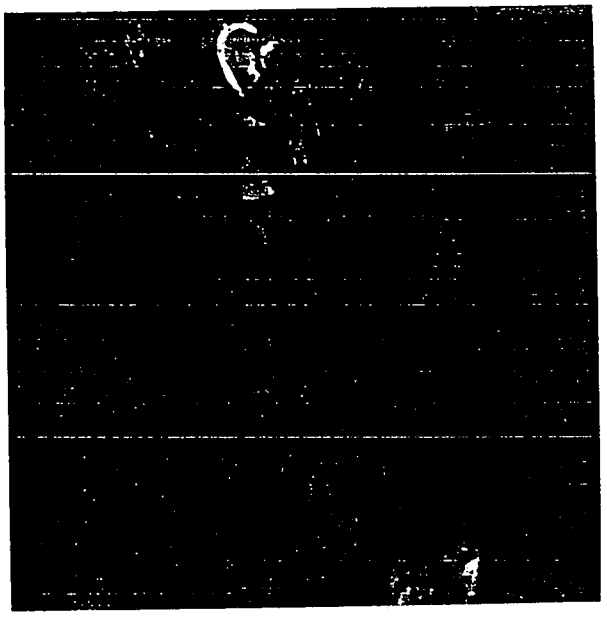
ATTIC FLOOR



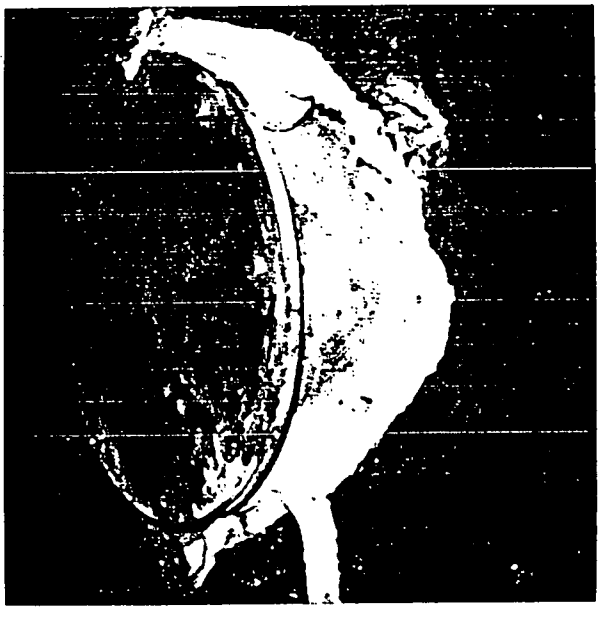
MGA
008



MGA-010



MGA-011



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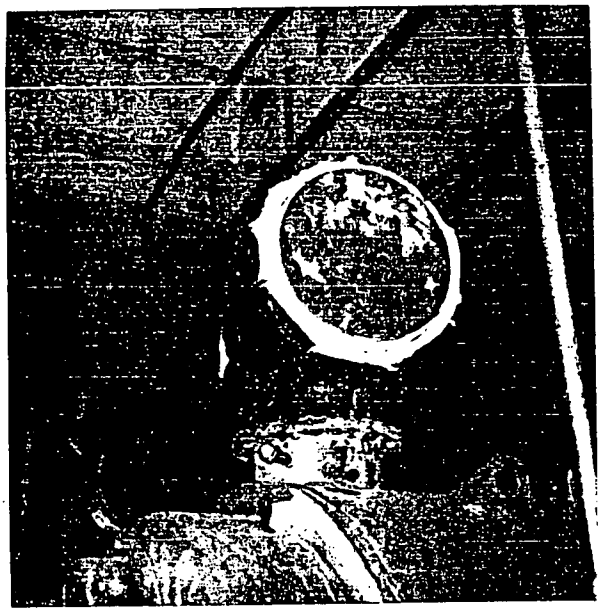

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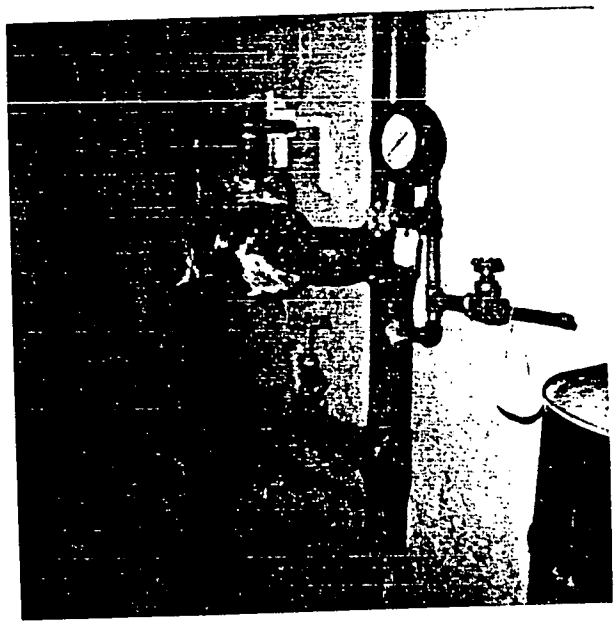

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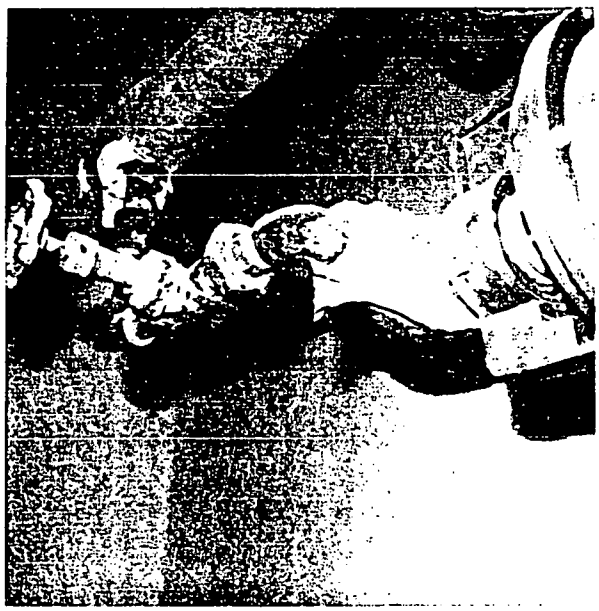
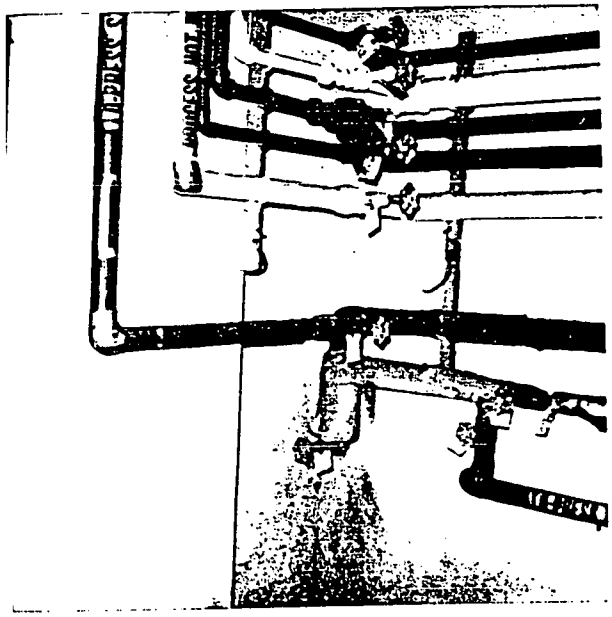


MGA-022

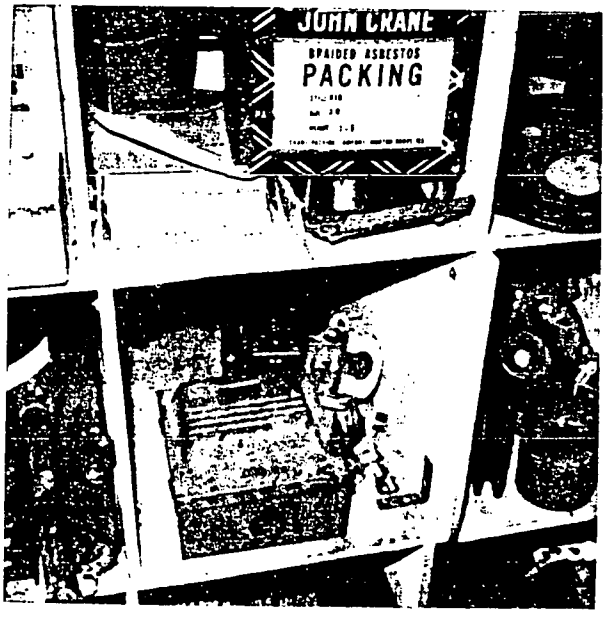


MGAS 003

MGA 002

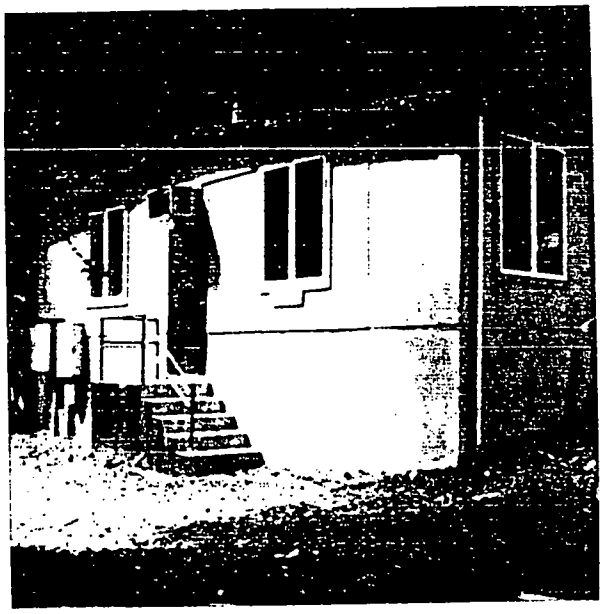
MGAS
007

Inside styrofoam 60X
MGAS 009



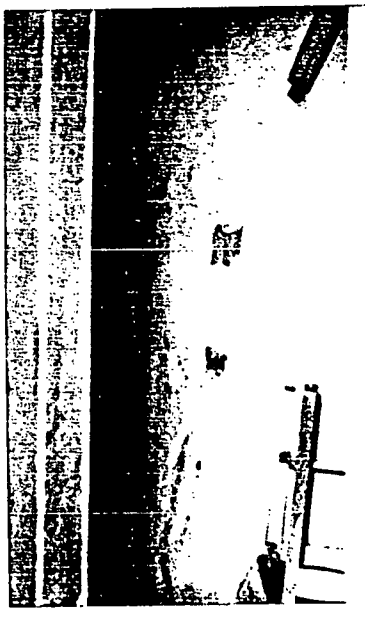
Room 1, Laboratory
Building

Room 1
Laboratory Building

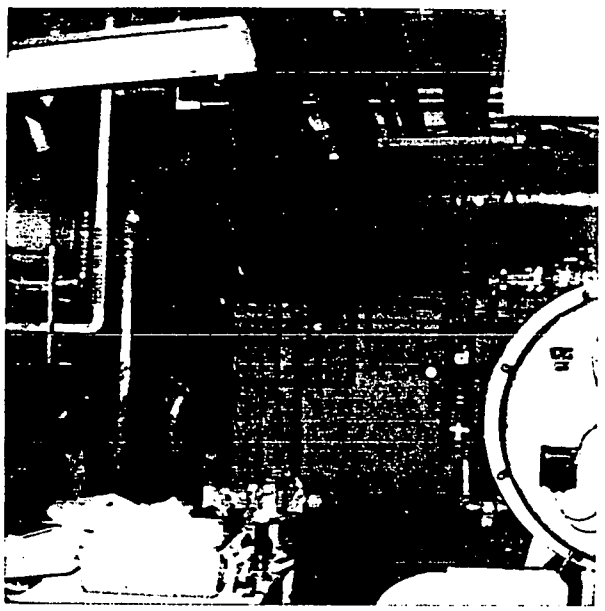


El Verde Site

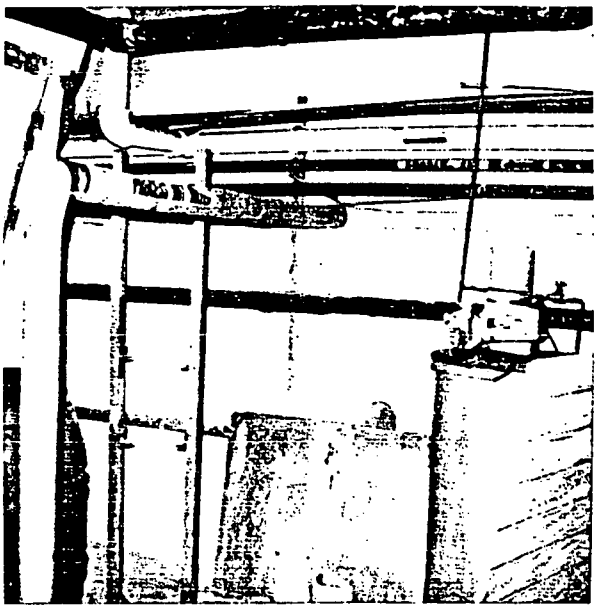
El Verde Site



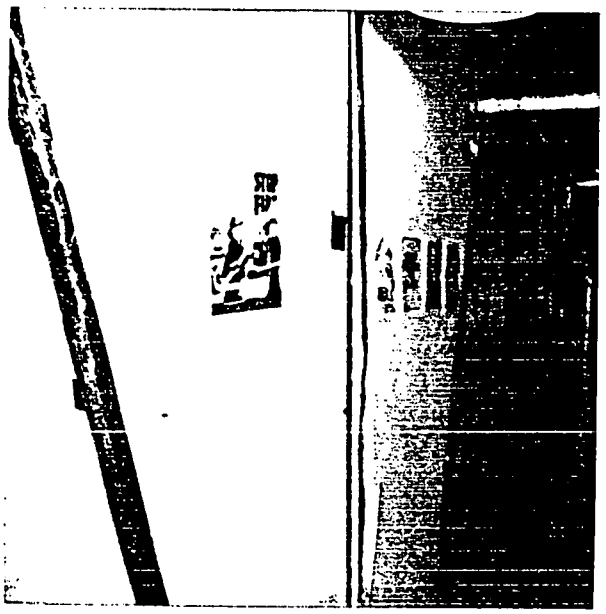
BBA-006



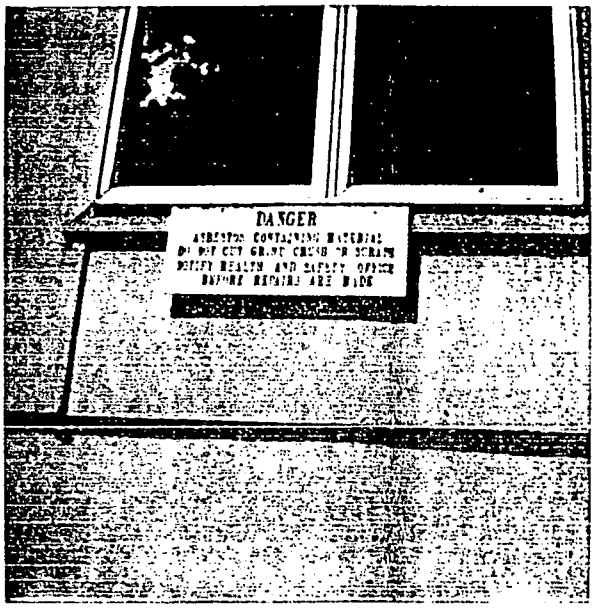
Laboratory Building
Basement



Laboratory Building
Basement



MGAS 009
Sample inside



El Verde Site

Department of Energy
Oak Ridge Operations
P.O. Box 2001
Oak Ridge, Tennessee 37831– 8600

SP
Cy to Pat M.

May 17, 1989

Dr. Alvin W. Trivelpiece, Director
Oak Ridge National Laboratory
Martin Marietta Energy Systems, Inc.
Post Office Box 2008
Oak Ridge, Tennessee 37831-6255

Dear Dr. Trivelpiece:

CHARACTERIZATION OF HAZARDOUS WASTE, ASBESTOS, AND RADIOACTIVE CONTAMINATION AT THE CENTER FOR ENERGY AND ENVIRONMENTAL RESEARCH (CEER) IN PUERTO RICO

There is an urgent need to obtain ORNL support for performing a preliminary assessment and developing the scope of work and related cost estimates for remedial action for hazardous waste, asbestos, and radioactive contamination that remains in Puerto Rico as a result of AEC/ERDA/DOE activities for the last 30 years. While the major remedial actions have already been completed, there are still the following actions that need to be taken:

1) Identification and Disposal of Chemical Waste

The following unknown chemicals need to be identified before disposal:

a. Approximately 150 bottles with different amounts of chemicals are stored at the Rio Piedras site; and

b. Three drums (55 gal. ea.), 10 lecture gas cylinders and 15 bottles of chemicals stored at the Mayaguez site.

2) Check Transformers for PCB Content

One transformer has been identified as containing PCB. Three other transformers are suspected of containing PCB.

3) Identify Nature and Extent of Asbestos Problem

a. Two transite asbestos temporary buildings - one in Mayaguez and the other at El Verde Research Site; and

b. Various hoods and structures, as well as piping and boiler insulation, are suspected of containing asbestos.

4) Determine Radiological Status of El Verde Research Site

a. The decontamination of this site was performed by CEER. Verification/certification still needs to be done by DOE; and

b. Two trees involved in radiological experiments have above-background levels of Cs 137 radioactivity. USDA Forest Service has requested that these be left in place, properly fenced and signed.

We have informally discussed with Mr. Lance Mezga, Energy Systems Central Staff, and Mr. T. H. Row, Director, Environmental and Health Protection Division, ORNL, the need to determine the nature and extent of these problems, and have been informed that appropriate technical experts could be made available as early as June 5. The qualifications of the personnel to be sent to Puerto Rico are as follows:

a. Hazardous waste expert that can identify the unknown chemicals and PCB problem and provide recommendations on the disposal or remedial action required;

b. Asbestos expert to identify the nature of the asbestos contamination and recommend the best way to remediate problems in this area; and

c. Radiological assessment expert to characterize any radiation contamination and/or provide recommendations for verification and certification of decontamination performed.

Since there are some potential health and environmental related violations in this situation, and we are also in discussions with the U.S. Department of Agriculture and the University of Puerto Rico for the transfer of these facilities, we request that you quickly identify the appropriate technical experts for performing this task in accordance with the scope of work and in general support of the schedule indicated above. All costs associated with this effort should be charged to funds already available in the ORNL Financial Plan under programs KP and AH.

The appropiate organization should contact Luis Velazquez of my staff at 6-0731 in order that a detailed scope of work and schedule be developed.

Sincerely,

Joseph A. Lenhard
Assistant Manager for Energy
Research and Development

cc:

O. B. Morgan, ORNL
T. H. Row, ORNL
L. E. McNeese, ORNL
M. E. Mitchell, K-25
R. B. Craig, K-25
L. Mezga, K-25
P. D. Dayton, AD-42, ORO
J. M. Penry, AD-46, ORO
H. W. Hibbitts, SE-31, ORO
D. Underwood, ER-121, ORO
S. S. Waddle, ER-122, ORO
C. S. Przybylek, CC-10, ORO

Department of Energy
Oak Ridge Operations
P.O. Box 2001
Oak Ridge, Tennessee 37831— 8755

Pat
Mayaguez PR
File

May 12, 1989

Mr. S. R. Leaman, Director
General Services Division
Agricultural Research Service
U. S. Department of Agriculture
6505 Belcrest Road
Hyattsville, Maryland 20782

Dear Mr. Leaman:

STATUS OF CLEAN-UP ACTIVITIES AT THE CENTER FOR ENERGY AND ENVIRONMENT RESEARCH (CEER) FACILITIES IN MAYAGUEZ, PUERTO RICO

This is in response to your letter of March 24, 1989, to Mr. Peter D. Dayton inquiring about the status of the decontamination and cleanup of the CEER facilities in Mayaguez, Puerto Rico.

A summary of the remaining remedial actions that need to be completed at the Mayaguez facility is as follows:

Radiological Decontamination at the Mayaguez Facility

This remedial action project was essentially completed in November 1987. Discharge of the decontaminated reactor pool water is the only remaining action that needs to be completed. Enclosed for your information is a letter from P. J. Gross, Director, Technical Services Division, DOE-Oak Ridge, to Dr. Alida Ortiz, CEER Acting Director, transmitting a Statement of Certification, which officially certifies that the decontamination of the Mayaguez facility meets all applicable criteria and standards. At this time, a request for a Bulk Discharge Permit is before the Puerto Rico Aqueduct and Sewer Authority (PRASA). A draft copy of the Bulk Discharge Permit from PRASA has been received, and plans are under way to update the analysis to demonstrate that the water still meets all applicable requirements stipulated by the permit. Upon receipt of the official PRASA permit, we will be ready to proceed with the disposal of the water.

File 4332.237

Removal and Disposal of Laboratory Chemicals

Another ongoing cleanup activity is the removal and disposal of laboratory chemicals resulting from DOE-funded programs from all CEER sites in Puerto Rico. While most of the laboratory chemicals have already been removed and disposed of, CEER is in the process of modifying a subcontract with Eastern Chemical Waste Systems to remove the following chemicals from the Mayaguez site:

1. Eighty-five-gallon overpack drum of Sodium Hydroxide;

2. Four lecture bottles of waste compressed flammable gas (methyl fluoride gas cylinder) and nonflammable gas (hexafluoroacetone);

3. One small canister of Mercury; and

4. Lithium Bromide used for shielding in hot cells.

In addition, the following unknown chemicals: 3 drums (55-gallon ea.), 10 lecture bottles of gases and 15 bottles of chemicals need to be identified before disposal. The 150 chemical bottles that you mentioned in your letter are not located at the Mayaguez site.

Items for Review

Review items include :

1. Asbestos - Various hoods and other structures fabricated with asbestos, as well as asbestos used for insulation of piping and boilers.

2. PCB - One transformer has been identified as containing PCB's. Three others are to be checked.

In order to verify the presence of asbestos and PCB, we will be sending a group of technical experts to Puerto Rico during the early part of June. This group will also propose a way to resolve the identity of the unknown chemicals to enable proper disposal. Their work will consist of performing a preliminary assessment, determining the action to be taken, and developing cost estimates in order to request the funding for remediating the areas which may be identified in the assessment.

I hope this provides you an adequate summary of where we are in the facilities restoration process. We will advise you of the findings of our June inspections. Based on these findings, we may organize a meeting including representatives from the University of Puerto Rico to delineate plans for the conveyance of the facility to USDA. If you have any questions, please contact Luis Velazquez of my staff at (615) 576-0731 or FTS 626-0731.

Sincerely,

Susan S. Waddle

for Larry L. Radcliffe, Director
Research and Waste Management
Division

Enclosure:
As stated

cc w/o enclosure:
S. S. Waddle, ER-12, ORO
D. Underwood, ER-121, ORO
L. E. Velazquez, ER-121, ORO
L. Clark, DP-85, ORO
P. Nicholson, AD-42, ORO
S. Morell, AD-42, ORO
J. L. Foutch, CC-10, ORO
R. E. Stephens, ER-44, HQ, Forstl.
A. Ortiz, CEER, UPR

Department of Energy
Oak Ridge Operations
P.O. Box 2001
Oak Ridge, Tennessee 37831 – 8621

March 24, 1989

Dra. Alida Ortiz, Acting Director
Center for Energy and Environment Research
University of Puerto Rico
G.P.O. Box 3682
San Juan, Puerto Rico 00936

Dear Dra. Ortiz

CERTIFICATION STATEMENT FOR THE CENTER FOR ENERGY AND ENVIRONMENT RESEARCH (CEER), MAYAGUEZ FACILITY

The Department of Energy has performed remedial action to decontaminate the CEER Mayaguez facility and radiological surveys were conducted to verify that the project was completed successfully.

Enclosed you will find a statement of certification for the CEER Mayaguez facility certifying that the decontamination meets all applicable criteria and standards.

Should you have any questions, please contact Mr. Larry W. Clark of my staff at (615) 576-2675.

Sincerely,

Peter J. Gross, Director
Technical Services Division

DP-85:Clark

Enclosure:
As stated

cc w/encl:
Bill Murphie, NE-23, HQ, GTN
Andrew Wallo, NE-23, HQ, GTN
Nimia Irizarry, CEER
Richard P. Nicholson, AD-42, ORO
Luis Velazquez, ER-121, ORO

STATEMENT OF CERTIFICATION: CENTER FOR ENERGY AND ENVIRONMENT RESEARCH, MAYAGUEZ FACILITY

The U.S. Department of Energy, Oak Ridge Operations Office, Technical Services Division, has reviewed and analyzed the radiological data obtained at the Center for Energy and Environment Research (CEER) Mayaguez Facility following the decontamination project conducted at the facility in 1987. Based on this review and analysis, the Department of Energy certifies that the CEER site is in compliance with Department of Energy decontamination criteria and standards developed to protect the health, safety, and environment.

This certification of compliance provides assurance that use of the property will result in no radiological exposure above applicable criteria and standards to members of the general public or site occupants.

By: _____
P. J. Gross, Director
Technical Services Division
Oak Ridge Operations Office
U.S. Department of Energy

Date: 3/27/89

EE-765

Department of Energy
Oak Ridge Operations
P.O. Box 2001
Oak Ridge, Tennessee 37831-8723

November 29, 1988

Dra. Alida Ortiz, Acting Director
Center for Energy and Environment Research
University of Puerto Rico
G.P.O. Box 3682
San Juan, Puerto Rico 00936

Dear Dra. Ortiz:

CEER REMEDIAL ACTION COMPLETION

I am pleased to inform you that the results of the post-remedial action radiological surveys have now been verified and that remedial action on the Center for Energy and Environment research (CEER) Mayaguez Facility has been satisfactorily completed. The property is now in compliance with the standards and guidelines applicable to the remedial action activities at the site. A description of the radiological surveys and the data supporting this determination are in the enclosed independent verification certification report.

A formal certification statement will be forwarded to you in the near future.

Thank you for your cooperation. If there are any questions, call me at (615) 576-0948.

Sincerely,

Peter J. Gross, Director
Technical Services Division

CE-53:Clark

Enclosures:
As stated

cc w/o encl:
Nimia Irizarry, CEER
Ron Freemerman, BNI
Bill Murphie, NE-23, GTN
Andy Wallo, NE-23, GTN

During the period of April to November of 1987, a decontamination project was conducted at the Center for Energy and Environment Research (CEER) under the U.S. Department of Energy's Surplus Facilities Management Program (SFMP). The decontamination guidelines applied to the project were those established in the "U.S. DOE Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facility Management Program Sites, Revision 1, July, 1985". These guidelines are derived from the "basic dose limit", a prescribed standard recognized by the International Commission on Radiological Protection (ICRP). The guidelines establish a methodology for developing permissible residual radioactivity levels that approach naturally occurring background levels, and serve as the criteria for governing the performance of the remedial action. When these criteria are successfully achieved in the clean up, as they were at CEER, it enables the site to be released to and used by the general public without any radiological restrictions.

No date

File CEER Discussions

Department of Energy
Oak Ridge Operations
P.O. Box E
Oak Ridge, Tennessee 37830

February 3, 1978

Dr. Juan A. Bonnet, Director
Center for Energy and Environment Research
Caparra Heights Station
San Juan, Puerto Rico 00935

Dear Dr. Bonnet:

DECONTAMINATION OF CEER MAYAGUEZ FACILITY

The Division of Environmental Control Technology has advised that an additional $125,000 is to be made available in a forthcoming Financial Plan to a total FY 1978 funding of $225,000 under Activity KN 03 60 14 for RPIS No. 800090: Decontamination of CEER Mayaguez Facility. Pending receipt of this additional $125,000 in a forthcoming Financial Plan and within funds currently available to you under Activity KN 03 60 14, you may proceed with the following work related to the decontamination of the CEER Mayaguez Facility:

1. Preparation of a Request for Proposal covering Phase I of the Decontamination Project for the engineering assessment and detailed work statements (including cost estimate) for the Phase II decontamination effort. The RFP should be on the basis of a fixed price quotation and should reflect the requirements and data in the Decontamination Plan which is currently under DOE review. A suggested list of firms to which the RFP should be sent is enclosed. Any organizations which have contacted CEER concerning interest in the decontamination work should be added to this list. The RFP should reflect the requirements of ERDA PR Subparts 9-1.54 and 9-7.103-54 (copies enclosed). The Disclosure Statement [9-1.5406(d)] and the Organization Conflicts of Interest Article (9-7.103-54) must be included in the RFP. The RFP should advise proposers that such article will be a part of any contract resulting from the RFP and that the successful proposer must accept its terms. In both the Disclosure Statement and the contract article, the word "university" should be substituted for the words "ERDA", "Government" and "Contracting Officer" manually stricken on the enclosed copies. The only exception is with respect to Subpart 9-7.103-54(e) wherein "Contracting Officer" and "Government" must so remain. [Please note the

addition made to 9-7.103-54(e) relating to the CEER contract.] The above instructions on "Organizational Conflicts of Interest" are limited to preparation of this RFP. General instructions for implementation of ERDA Subpart 9-1.54 are forthcoming. Please submit the RFP for the Phase I work to us for review and approval prior to issuance.

The actual decontamination, Phase II of the project, is to be accomplished under a separate RFP.

✓2. Use of CEER forces to accumulate, package and ship to the Continental United States existing radioactive wastes, debris and other radiation sources excess to CEER-UPR continuing needs. Detailed work statements concerning the packaging, redrumming and dismantling work to be undertaken by CEER including procedures to assure safe handling of these materials should be submitted to us for review and approval prior to the actual initiation of this work. No decontamination work involving the structural integrity of the facility including its safety systems should be undertaken by CEER. The accumulated wastes at the Rio Piedras facility may be included in this effort.

The following organizations should be contacted for cost quotations for receipt and disposal of the radioactive wastes and debris along with their requirements (i.e., information on the content of the wastes and packaging requirements) for acceptance of shipments for disposal:

Chem Nuclear Systems, Inc.
Eastern Operations
Post Office Box 726
Barnwell, South Carolina 29812
(Phone: 803-259-3588)

Nuclear Engineering Company, Inc.
9200 Shelbyville Road
Louisville, Kentucky 40222
(Phone: 502-426-7160)

The work to be undertaken by CEER forces should include disposal of the wastes listed in the CEER "Solid Waste Semiannual Report" including those items in this latter report which are not covered in the Decontamination Plan.

1. With regard to the radium sources listed, the Environmental Protection Agency is conducting a radium recovery operation.

With regard to EPA requirements and availability of EPA furnished shipping containers for such radium sources, you should contact:

Mr. Robert Callis, Chief
States Assistance and Safety
Eastern Environmental Radiation Laboratory
Environmental Protection Agency
Montgomery, Alabama
(Phone: 205-272-3402, FTS 534-7700)

Copies of the Certificate of Compliance for any EPA furnished shipping containers should be provided to us for review.

2. Instructions concerning the disposal of wastes and other sources containing plutonium, thorium, and uranium will be provided to you in the near future.

✓ 3. Close attention must be given to shipping containers particularly with regard to special nuclear materials and to sources which exhibit significant amounts of radiation. All shipments must conform with the Department of Transportation Regulations, Title 49 CFR 173.389 through 173.398. All shipping containers to be used should be identified to Oak Ridge so that we can assure that all relevant requirements are being met. Also please identify to us by DOT specification number the type of drums to be used for shipping low specific activity wastes.

As needed, you may anticipate assistance from ORO in regard to availability of approved shipping containers and shipping arrangements. Your timely attention to this matter will be appreciated.

Sincerely,

Joseph A. Lenhard

Joseph A. Lenhard, Director
Research and Technical Support Division

ORR:CLY

Enclosures:
1. List
2. ERDA PR 9-1.54 & 9-7.103-54

cc w/o encls:
C. A. Keller
T. H. Hardin
E. L. Keller
W. H. Travis
T. W. White (2)

cc w/encls:
C. W. Hill
F. O. Christie