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Jesse Lieberman, Chief
Occupational & Radiological Health Section
Environmental Health Services
Philadelphia Department of Public Health
500 South Broad Street
Philadelphia, Pa. 19146

4 September 1970

Dear Mr. Lieberman:

On behalf of the Ad Hoc Committee on Environmental and Occupational Hazards of Spray Asbestos Fibers, I am happy to submit the Committee's final report, thus completing the Committee's assignment.

The report reflects the Committee's consensus with only one dissenting vote regarding Recommendation A. Mr. James Morgan expressed the opinion that requiring the use of asbestos-free fireproofing materials after the three month transition period may be compromising fire protection since he feels it may take several years before experience can show how effective such materials are. He believes, therefore, that the construction industry should be given time to develop the engineering techniques necessary to apply and control asbestos spray fireproofing to meet the performance requirements under Recommendations B and C and that the use of asbestos spray should not be prohibited without exception.

We would like to thank Mr. Wallach and Mr. Wilson for all of the assistance members of their staffs gave the Committee and you, in particular, for your persistent effort to evolve an equitable resolution of the problem to the best interest of the public.

We trust the report will prove of value to the Department of Public Health and Dr. Sturgis and I will be glad to discuss it, as you suggested, at the next meeting of the Board of Health.

Sincerely yours,

R. O. Gorson
Robert O. Gorson (Chairman)
Professor of Medical Physics

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REPORT OF THE PHILADELPHIA DEPARTMENT OF PUBLIC HEALTH
AD HOC COMMITTEE ON ENVIRONMENTAL AND OCCUPATIONAL HAZARDS OF SPRAY ASBESTOS FIBERS
August 31, 1970

INTRODUCTION:

In the Fall of 1969, Air Management Services (AMS) learned that extensive pollution of the environment with spray asbestos fibers was occurring at a building under construction at 5 Penn Center, as a result of structural steel fireproofing operations involving the use of spray asbestos material. Efforts by AMS to persuade the contractors to institute effective measures to prevent further pollution of the environment met with little success. Subsequently, with the support of its consultants, AMS instituted a permit requirement for the use of spray asbestos materials in future construction and adopted a "total containment" policy, i.e., that spraying operations must be conducted under conditions that prevent the escape of any visible amounts of asbestos into the environment.

By the Spring 1970, construction work had begun on three other steel structures in the city wherein spray asbestos material was used. Although the release from those sites of spray asbestos material was, in general, less serious than that experienced at 5 Penn Center, there were numerous violations of the "total containment" policy and the result was far from satisfactory.

Meanwhile, the Section of Occupational and Radiological Health of the Environmental Health Services (EHS) was alerted to the potentially heavy exposure of construction workers to asbestos fibers. Accordingly, Section personnel carried out numerous inspections of the building sites and eventually concluded that voluntary efforts to control the exposure of workers to airborne asbestos fibers would not succeed without adoption of specific regulations by

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the Department of Public Health. It also became apparent that erosion of spray asbestos fibers from the surface of air plenum chambers might occur and contaminate the building air supply and subject occupants to a potential hazard of unknown degree.

These problems were discussed at meetings (November 5, January 7, and April 1) of the Philadelphia Board of Health. As a result, the Board authorized the Occupational Health Section of EHS to study the potential hazards arising from the construction industry's use of spray asbestos materials for building fireproofing in Philadelphia, and to submit to the Board such proposed regulations and recommendations that the Section felt necessary or advisable.

After consulting with a number of experts on the hazards of asbestos exposures, Jesse Lieberman, Section Chief, appointed an ad hoc committee to review the problem and to recommend specific courses of action and proposed regulations. Mr. Lieberman considered it important to appoint to the Committee, individuals highly competent in their respective areas of expertise and representing different interests and viewpoints. The ad hoc Committee was appointed formally on 3 July 1970 with the following membership:

Davis N. Bressler, Esq.
Shapiro & Bressler

Robert O. Gorson, M.S. (Chairman)
Prof. of Medical Physics
Thomas Jefferson University

Thomas McCormick, Union Business Agent
Plasterer's Union Local #8

James F. Morgan
Consultant in Industrial Hygiene
E.I. DuPont de Nemours & Co.

Eugene P. Pendergrass, M.D.
Emeritus Professor of Radiology
University of Pennsylvania

F. Spencer Roach, Architect
Harbeson, Hough, Livingston,
& Larson

Katherine R. Sturgis, M.D.
Woman's Medical College

Harry M. Verdier, Executive Director
Safety Council
Greater Philadelphia Chamber of
Commerce

Henry Wohlers, Ph.D.
Prof. of Environmental Engineering
Drexel University

Herbert E. Wolf, Assistant Manager,
Engineering Dept.
Reliance Insurance Company

The Committee as a whole conducted four sessions: July 10, 23, August 4, and 31. During its first three sessions, the Committee received presentations from members and consultants of the Health Department and from invited experts in building construction, the asbestos mining and milling industry, the plastering industry, the spray mineral fiber industry, industrial hygiene, epidemiology, industrial and preventive medicine, and pathology. The individuals who made presentations at one or more sessions are listed in Appendix A.

Two working groups were appointed, the first to prepare a draft of precautions for controlling the emission of asbestos fiber from spray operations, and the second to prepare a draft of this report. These drafts were discussed extensively at the Committee's fourth meeting, and after modification and editing, were approved. The remainder of this report sets forth the Committee's findings, conclusions, and recommendations.

FINDINGS AND CONCLUSIONS:

(1) Gross environmental contamination with visible amounts of spray asbestos material has been produced on a number of occasions in and around construction sites wherein spraying activity was being conducted. Not only was the public in the immediate vicinity of the sites grossly exposed to spray asbestos material on a number of occasions, but so were the construction workers on the site, especially those spraying operators who failed to use protective masks and/or protective clothing provided them. The Committee is also concerned about the potential:

(a) exposure of maintenance personnel to asbestos fibers when entering asbestos sprayed enclosures;

(b) hazard, if any, to the occupants of those buildings arising from the ventilation of such buildings after erosion or dislodging of

asbestos fibers in the air plenum chambers;

(c) environmental contamination arising from future alterations to and eventual demolition of the buildings.

(2) The Committee was assured by each person who appeared before it, that each shared to varying degrees the Health Department's concern in this matter and that many steps had already been or were being taken to deal with the problem. All of the representatives of the various interests fully cooperated with the Committee and demonstrated deep interest in working out effective and practical ways of dealing with the problem.

(3) The lack of containment of the spray asbestos material and the exposure to workmen on the site were caused by a number of factors. Among these were difficulties inherent in architectural design, negligence on the part of some sprayers, lack of responsibility or authority on the part of one prime contractor to control the activities and work scheduling of other prime contractors and their subcontractors, indifference or ignorance concerning the potential hazards of exposure to airborne asbestos fibers on the part of some of the spray operators and other construction workers, adverse weather conditions, and lack of personnel with adequate knowledge, ability and authority to exercise overall supervision of all activities that could cause immediate or subsequent escape of spray asbestos material. Contractors, in general, did not allow for the cost of such controls in their bids, nor did architects usually specify measures for such controls.

(4) There is no on-going program for periodic medical examinations, such as chest x-rays, for the sprayers of asbestos fireproofing material nor for those involved in the cleaning up after spraying.

(5) It is difficult to ensure 100% containment of airborne asbestos material during the spraying operation. In the absence of 100% containment, the cementitious process allows considerably less airborne material to escape

the premises than does the competing "fluff technique" process. However, cleaning up is quite difficult since the material adheres firmly where it falls. The Committee is not in the position to judge the other relative merits of the two competing processes.

(6) The coordination of the inspection and enforcement activities of AMS and EHS at times left something to be desired with regard to controlling spray asbestos operations. There also appeared to be a lack of coordination of the actions taken independently by the District Attorney's office with the activity of these Services. The Committee believes that all branches of local government should closely coordinate their efforts in safeguarding the health and welfare of its citizens.

(7) The AMS and particularly the EHS, lack the essential resources, i.e., qualified manpower, instrumentation and measurement capabilities, and supporting funds, necessary to conduct the constant surveillance necessary to safeguard all citizens subject to possible exposure from the potential hazards of airborne spray asbestos fibers. The Committee believes that the segment of the construction industry that utilizes spray asbestos material should bear a major portion of the cost of an adequate surveillance and monitoring.

(8) The prolonged exposure of asbestos workers to high concentrations of airborne asbestos fibers is clearly implicated as a cause for the high incidence of asbestosis, a pneumoconiosis, and bronchogenic carcinoma in such workers. There also is considerable evidence relating the development of pleural and peritoneal mesotheliomas, a very rare and fatal form of malignancy, in patients with history of long exposure to asbestos fibers. Data suggest that asbestos, itself, may not be carcinogenic but that trace elements or other agents associated with natural asbestos or in the environment that become attached to the asbestos fibers during milling, processing, and other operations may be the causative agents alone or in combination with asbestos. The

probability of developing lung cancer is very much greater among asbestos workers who smoke cigarettes than among those who do not smoke.

(9) Data are virtually non-existent concerning the possible deleterious effects of chronic exposure to low concentrations of asbestos fibers, such as that found in the ambient air of most metropolitan areas or around construction and demolition sites. Nevertheless, the Committee agrees with many experts in the field that, until persuasive evidence to the contrary is forthcoming, it is prudent for public health officials to assume that there is no level of concentration of airborne asbestos fibers below which adverse effects will not occur in population groups chronically exposed. Accordingly, the Committee endorses the consensus of many experts that every reasonable method should be exercised to limit the discharge of asbestos fibers into the environment from all sources.

(10) With regard to limiting the occupational exposure to asbestos fibers, the Philadelphia Department of Public Health, as well as the Pennsylvania Department of Health use as a performance standard (threshold limit values) the limits specified in Chapter 4 of Article 432 of the Rules and Regulations of the Department of Health of the Commonwealth. In April 1970, the American Conference of Governmental Industrial Hygienists (ACGIH) adopted a proposal to lower the threshold limit values in places of employment, to become effective in approximately two years. It appears unlikely that State Regulation 432 can be amended to reflect the revised standard in the near future. However, the Committee believes that the Philadelphia Department of Health should adopt as soon as possible, its own performance standard, consistent with the ACGIH proposed values, to apply to airborne asbestos fibers from all sources within the working environment.

(11) The Committee believes that in contrast to the control measures practical in manufacturing industries, the methods of controlling the dispersion of spray asbestos fibers available to the construction industry are not adequate to protect all citizens (construction workers, maintenance and operating personnel, future occupants of the buildings and the general public) from some degree of exposure to asbestos fibers from the spray material during construction, throughout the life of the structure and during alteration and final demolition. Accordingly, the Committee believes that the Philadelphia Department of Health (in cooperation with other health departments and the United States Public Health Service) should effectively encourage the manufacturers of spray fireproofing material to develop acceptable fireproofing substitutes which contain essentially no asbestos. The Committee notes that the manufacturers are actively working to develop acceptable substitutes, which may be forthcoming in six months or less. The Committee believes that a "total containment" policy should apply to any substitute material until such time as the potential hazards of any airborne particles from such materials have been evaluated. If such substitute material is judged by medical experts to be without hazard, the containment policy can be relaxed.

SPECIFIC RECOMMENDATIONS:

The Committee recommends the Department of Public Health of the City of Philadelphia adopt forthwith the following specific proposals:

A. Elimination of spray asbestos material:

A regulation be adopted to the effect that no spray asbestos material shall be applied in building construction, reconstruction or alteration within the City of Philadelphia three months subsequent to (1) the adoption of the regulation, or (2) at such earlier date on which approved asbestos free spray fireproofing substitutes are commercially available from at least two manufacturers.

B. Performance standards for the protection of workers on the construction site:

Regulations be adopted that:

(1) All necessary precautions shall be taken to prevent anyone within the construction site from being subjected to airborne asbestos fiber concentrations, caused directly or indirectly by the spray material, exceeding the Maximum Permissible Concentrations adopted by the Philadelphia Department of Health.

(2) No person on the construction site shall be exposed to the inhalation of airborne asbestos fibers exceeding the following Maximum Permissible Concentration: 5 fibers/cc of size greater than 5 microns in length average over any eight hour period, provided the concentration in any fifteen minute period does not average more than 15 fibers/cc, as determined by measurement techniques acceptable to the Philadelphia Department of Health.* Airborne concentrations of asbestos fibers exceeding the limits will be permitted in only those controlled areas wherein all persons wear respirators and/or other protection devices which effectively reduce the asbestos fiber concentrations to the permissible limit at the point of inhalation.

C. Prevention of the release of spray asbestos material into the environment:

A public announcement, that the Philadelphia Department of Public Health has adopted a "total containment" policy, i.e., that:

(1) the prime contractor and/or any subcontractors shall take all necessary precautions to prevent the release into the environment of any visible amounts of spray asbestos material, and of invisible amounts exceeding a performance standard to be adopted by regulation.

(2) A regulatory performance standard that airborne concentrations of asbestos fibers at any point beyond the building perimeter shall not be visible to the unaided eye and at any point 20 feet beyond the perimeter shall not exceed

*Phase contrast microscopy at 430X. See for example: "Equipment and Procedures for Mounting Millipore Filters and Counting Asbestos Fibers by Phase Contrast Microscopy" by Bayer, Zumwalde and Brown, USPHS (July 1969).

1 fiber/cc of size greater than 5 microns averaged over any 15 minute period as determined by measurement techniques acceptable to the Philadelphia Department of Health.*

D. Implementation of performance standards for controlling the exposure to spray asbestos fibers

Regulations be adopted that:

(1) All applications for a permit to use spray asbestos material shall be reviewed by both the AMS and the EHS (Occupational Health Section) before such permit may be issued. Such applications shall be submitted by the prime contractor responsible for spray fireproofing at least two calendar weeks prior to the start of spraying.

(2) One person shall be designated by the responsible prime contractor as having full time supervisory authority for all aspects of the spraying operation. He shall be the person directly responsible for monitoring all operations from which the release of asbestos fibers could result, in such manner as to insure compliance with the pertinent asbestos control regulations and work requirements (see Appendix B). The name and qualifications of the individual so designated shall be submitted to the Philadelphia Department of Public Health by the prime contractor at the time of application for the installation permit and operating license.

(3) The prime contractor responsible for spray fireproofing shall provide written assurance at the time of applying for the permit, that each employee engaged in spraying, mixing, handling and clean-up of asbestos material has or will have completed a satisfactory course of instruction on the potential hazards of exposure to asbestos fibers and instruction on the precautions that must be observed to control the hazard before he is assigned to the job. Each such employee shall sign a statement filed with the prime contractor that he will comply with the working requirements that are submitted for approval at the time of the permit application.

* See footnote on page 8.

(4) All other prime contractors shall also apply to AMS for a similar permit and shall likewise provide written assurance that their employees and those of their subcontractors assigned to the job site will have been instructed on the precautions required to prevent the dislodging, dispersion and inhalation of asbestos spray material, and on approved clean-up procedures, before spraying commences or before they are assigned to the job site.

(5) Each prime contractor shall at the time of applying for the permit, post an appropriate bond in the amount of \$_____. Such bond shall be refunded to the contractor at the end of all operations which could cause the release of spray asbestos fibers if it has been demonstrated to the satisfaction of the AMS and the EHS that all reasonable precautions were taken to comply with performance standards and that there have been no substantial violations.

E. Requirements for periodic medical examinations for spray asbestos workers:

A regulation be adopted that all contractors using spray asbestos material shall provide pre-employment medical examinations, including chest x-ray examinations, of all new employees. All such employees shall have periodic chest x-rays and sputum cytology examinations at intervals not exceeding six months. The results of such examinations shall be reported to EHS of the Philadelphia Department of Public Health.

INDIVIDUALS WHO ATTENDED ONE OR MORE COMMITTEE SESSIONS TO PRESENT INFORMATION

1. Jesse Lieberman, Chief, Occupational Radiological Health Section, Environmental Health Services, Philadelphia Department of Public Health.
2. William Reilly, Director of Compliance and Enforcement, Air Management Services, Philadelphia Department of Health.
3. Dr. P.W. Purdom, Professor and Director of Environmental Engineering and Sciences, Drexel University.
4. Karl Schofield, Deputy City Solicitor, Law Dept. City of Philadelphia.
5. Arthur Wallach, Assistant Commissioner of Health, Environmental Health Services, Philadelphia Department of Public Health.
6. A.W. Lookup, Structural Engineer, A.W. Lookup Co. Phila. Pa.
7. M.R. Whitman, Whitman Brothers, Inc., Plastering Contractor.
8. Dr. W.J. Nicholson, Director, Insulation Industry Hygiene Research Program, Environmental Science Laboratories, Mt. Sinai School of Medicine, New York, N.Y.
9. Harold Romer, Assistant Commissioner, Dept. of Air Resources, City of N.Y.
10. Edwin Venzie, Venzie Corp., Plastering Contractor.
11. Stanley Fonfa, Sprayon Research Corporation.
12. Herbert Levine, President, Sprayed Mineral Fiber Manufacturers Association.
13. D.G. Powell, J. Cintani, and M. Waxman, Zonolight Division, W.R. Grace Co. Inc
14. Charles Scull, Sanitarian I, Environmental Health Services, Phila. Dept. Health
15. Louis J. Cralley, Ph.D., Director, Division of Epidemiology and Special Services, Bureau of Occupational Safety and Health, U.S. Public Health Service.
16. Paul Gross, M.D., Professor of Pathology and Occupational Health, Graduate School of Public Health, University of Pittsburgh.
17. Jan Lieben, M.D., Medical Director, FMC Corporation.
18. Norman Williams, M.D., Prof. of Preventive Medicine, Thomas Jefferson University
19. Edward Wilson, Chief, Air Management Services, Philadelphia Dept. of Public Health.
20. Sidney Speil, Ph.D., Director of Research, Piping and Mining Division, John Mansfield Corporation.
21. Leon Gonshor, Regional Industrial Hygienist, Pa. State Dept. of Health.
22. Clement Lazenka, Director of Engineering, Air Management Services, Phila. Dept. of Public Health.
23. James F. Morgan, Consultant in Industrial Hygiene, E.I DuPont deNemours & Co.
24. Charles McBride and Raymond L. Weinmann, General Building Contractors Association, Inc.

APPENDIX B

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REQUIREMENTS FOR CONTROLLING THE EXPOSURE TO SPRAY ASBESTOS FIBERS

1. Responsibility

A. No person shall cause any individual to be exposed to asbestos dust in excess of the limits adopted by the Philadelphia Department of Public Health.

B. All work performed in the construction, modification, and repair of a building or site where asbestos containing fireproofing materials are employed shall be under the direction of a person responsible for asbestos safety therein. His name shall be reported to the Department.

C. The person in charge of the asbestos safety program at a construction site shall have the following responsibilities. He shall:

1. Inform himself of the hazards attendant upon the presence of asbestos at the site, or if necessary, to this end obtain the services of a qualified expert.

2. Provide or cause to be provided any necessary instruction concerning safe working practices to all employees whose duties necessitate the handling of asbestos containing material or operation of any equipment that emits asbestos dust in amounts that lead to a hazard, and to all other employees who are not regularly employed at such work but who may be exposed to asbestos dust.

3. Take all necessary precautions that all workers engaged in the spray application of asbestos containing materials and other workers whose duties cause exposure to excessive amounts of asbestos dust, such as sweepers, clean up men, chippers, repair personnel, etc. are provided with U.W. Bureau of Mines approved respirators, for pneumoconiotic-producing dusts and furnished with suitable coveralls which will be left at the site and thereby preclude the removal of asbestos from the site.

4. Take all necessary precautions that procedures are instituted and supervised that preclude the removal and dispersal of asbestos containing material from the construction site on the clothing or other appurtenances of persons leaving the area.

5. Take all necessary precautions to provide for the safe disposal of asbestos containing waste materials from the construction sites by providing suitable bags or containers strong enough to resist tearing or breakage for transport to the disposal site.

6. Inspect all bags containing asbestos fireproofing and waste materials to make certain that they are not torn or broken during use or disposal. In the event any bag is torn or broken, its contents will be immediately transferred to a new bag.

7. Provide that durable and legible warning signs be conspicuously posted outside of enclosures warning persons of the hazard of entering the enclosure without an appropriate respirator and other apparel.

8. Take all necessary steps and precautions to provide that the area or areas being sprayed with asbestos containing material is totally enclosed in such a manner as to prevent the escape of material from the enclosures.

9. Take all necessary steps to prevent the continuation of the application of asbestos containing material whenever weather conditions are such as to preclude the effective containment of material, e.g. high winds.

10. Provide for continuous inspection of construction site vicinity for escape of asbestos material, halt all operations causing such escape, and immediately provide for clean-up of emissions.

11. Requirements for the Prime Contractor Responsible for Asbestos Spray Fireproofing

A. Permit applications and the satisfaction of all city regulations shall be completed by the responsible Prime Contractor two (2) calendar weeks prior to the start of spray fireproofing.

B. Notice of intent to spray asbestos-containing material on any premises shall be given to the Philadelphia Department of Public Health (Department of Air Management Services). Said notice shall be oral, by telephone, and in writing and shall specify, at least two (2) days prior to said spraying the floors on which the spraying shall take place.

C. The responsible prime contractor shall designate one person as having full-time supervisory authority for all safety aspects of the spraying operation as required under 1 (B). The name and qualifications of the individual so designated shall be submitted to the Philadelphia Department of Public Health at the time of application for the installation permit and operating license.

D. Recommended Control Practices

1. Before the start of spraying operations all floor enclosed areas shall be shoveled clean. Before the application of asbestos containing material commences, the floor of the enclosed area shall be cleared of all objects, material and equipment other than that employed in the application and the asbestos containing insulation or all objects, materials, etc. shall be covered with plastic or other approved tarpaulins in a manner that precludes the subsequent dispersal of asbestos particulates.

2. The entire floor, or the part of the floor to be insulated shall be enclosed with plastic or other approved tarpaulins in a manner which shall preclude the escape of asbestos containing material from the enclosure.* All interior open areas, such as elevator shafts, stairwells, etc., shall be enclosed in a manner which shall prevent the escape of asbestos containing material from the working area.

*Due to variations in architectural design and construction techniques, additional requirements may be imposed for permit approval where full containment appears to be difficult.

"Stack effect" of the shafts, stairwells, etc. shall be considered in providing proper enclosures. An enclosure will be considered satisfactory only if visible insulating material cannot escape from the enclosure.

3. Wet asbestos containing material which has fallen to the floor shall be swept up to prevent dispersal of dried material. Under no condition shall this material be removed later than at the end of the working day. Swept up material shall be placed in a heavy plastic bag strong enough to resist tearing or breaking under normal handling conditions and clearly marked as containing asbestos waste. The contents of the aforementioned plastic bags shall not be transferred to another container. The plastic bags shall be placed upon a vehicle for disposal at an approved site.

4. All floors will be vacuumed shortly after drying. The vacuum cleaner shall contain a strong, single-service, disposable inner bag of durable material which shall be removed from the vacuum cleaner and tightly sealed. The bag shall then be placed in a container of the type described in paragraph 3, which shall thereafter be placed on a vehicle for removal and disposal at an approved site.

5. The materials used to form the enclosure shall be thoroughly vacuumed upon completion of the application of the insulation in the area. The entire floor area, all ledges and surfaces including tarpaulins upon which waste insulation material may have fallen, shall then be vacuumed or revacuumed before removal of the enclosures.

6. Enclosures shall not be dismantled until the area has been thoroughly vacuumed after completion of spraying and clean-up. During the entire construction period, dislodged spray material shall be vacuumed immediately as in paragraph 4.

7. All areas used for opening bags containing asbestos insulating material and/or charging of hoppers shall be enclosed in such a manner that asbestos containing insulating material shall not be permitted to escape from the immediate area in which such activity takes place.

8. Signs shall be posted outside enclosures warning persons of the hazards of entering the enclosures without appropriate mask and other apparel.

9. All persons involved in the spraying of asbestos at the site must be furnished with Bureau of Mines approved respirators for pneumoconiosis producing dust or equipment as required by Pa. State Department of Labor and must be furnished with suitable coveralls and/or four weather gear which will be left at the site and thereby preclude the removal of asbestos from the site. No person shall be permitted in an area in which asbestos spraying or handling has taken place until final vacuuming referred to in paragraph 5, unless such person is furnished with and wears a Bureau of Mines approved respirator for pneumoconiosis producing dust and coveralls of the type described herein. Facilities shall be provided and procedures instituted and

supervised that preclude the removal and dispersal of asbestos containing material from the construction site on the clothing or other appurtenances of persons leaving the area. Water, soap and paper towels will be supplied for washing of hands prior to any eating or smoking. No smoking will be permitted within the spray area.

10. Any plenum or other structures coated with asbestos containing insulation which is intended for use in the circulation of air in the building must be thoroughly cleaned of all debris and waste insulation. All applied asbestos containing insulation within a plenum or duct must be coated with a sealant which precludes exposure of the asbestos containing material to the circulating air.

11. In case of emission of asbestos from the construction site, immediate steps shall be taken to cause the cessation of such emissions by either effective control measures or work stoppage at the source of the emissions. There shall then be immediate and complete cleanup of all material that has escaped the construction site by measures that will insure that no further dispersal of any asbestos material into the atmosphere can occur.

Note: Regardless of adherence to the stated control practices, any visible emission of asbestos-containing materials beyond the building perimeter will be considered as a violation of the Regulations of the Philadelphia Department of Public Health and will be subject to appropriate legal actions. In the experience of AMS and EHS to date, extraordinary diligence to the schedule of control methods is required in order to avoid violations.