

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE  
CENTER FOR DISEASE CONTROL  
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH  
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION  
REPORT HE 79-68-599

UNITED STATES TESTING COMPANY, INC.  
HOBOKEN, NEW JERSEY

JUNE 1979

I. TOXICITY DETERMINATION

The National Institute for Occupational Safety and Health conducted a health hazard evaluation at the United States Testing Company, Hoboken, New Jersey on April 18-19, 1979. Employees' exposure to asbestos was investigated. The following determinations are based on environmental measurements, employee interviews, observation of work practices, ventilation measurements and a review of the current literature and toxicity criteria.

The time-weighted average concentrations for asbestos measured on three workers were 0.27 fibers/cc, 0.18 fibers/cc and non-detected. Two of the three samples exceeded the current criteria of 0.1 fibers/cc recommended by NIOSH. These samples also exceed the current OSHA policy requiring medical examinations when employees' exposures exceed 0.1 fibers/cc. Engineering controls, therefore, should be improved to achieve the lowest feasible exposure levels for each work area. The improvement of certain work practices will also aid in reducing exposure. Recommendations for these improvements are given at the end of this report.

In addition to exposure to asbestos, employees are most likely being exposed to a variety of unknown substances. Materials such as urethanes or carpets of unknown composition or surface treatment are being tested by burning. This process could, and in all probability, does release unknown materials into the work area. Such substances could account for the reported eye and throat irritations, bad odors, and slight nausea reportedly experienced by employees at times. Poor ventilation systems also permit contaminants to re-enter the work areas and allows for contaminant build-up. Because many of the materials tested are of unknown composition and testing may result in a multiplicity of decomposition products, complete environmental monitoring and identification are infeasible. No volatile materials were detected or identified by charcoal tube sampling on the day of the evaluation.

However, only one type of material was tested during the sampling procedure and no conclusions concerning exposure should be made when other materials are being tested. Therefore, exposure to such materials must be controlled by the use of engineering and administrative controls and by strict adherence to work practices that will minimize exposure. Recommendations to minimize exposure are given at the end of this report and many closely correlate with changes which should be instituted to reduce asbestos exposure.

## II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from NIOSH, Publications Office at the Cincinnati address.

Copies of this report have been sent to:

- a) United States Testing Company, Inc., Hoboken, New Jersey
- b) Authorized Employee Representative
- c) International Brotherhood of Electrical Workers, Local 1936, Hoboken, New Jersey
- d) International Brotherhood of Electrical Workers
- e) U.S. Department of Labor, Region II
- f) NIOSH, Region II

For the purpose of informing the approximately four "affected employees", the employer shall promptly post for a period of thirty calendar days, this Determination Report in a prominent place(s) near where exposed employees work.

## III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The National Institute for Occupational Safety and Health (NIOSH) received such a request from an authorized representative of the International Brotherhood of Electrical Workers, Local 1936 regarding exposure of employees to asbestos in the Fire Technology and Flammability Section of the Engineering Department of the U.S. Testing

Company. The request stated that employees were experiencing burning eyes and throats, headache, and occasional slight nausea due to work exposure. The request also stated the employees' concerns about long term health effects resulting from exposure to asbestos.

#### IV. HEALTH HAZARD EVALUATION

##### A. Process Description

The United States Testing Company is involved in chemical, mechanical, including new and experimental materials. The evaluation performed at the U.S. Testing Company concerned the Fire Technology and Flammability Section of the Engineering Department. This section is involved in testing various materials including carpets, wallcoverings and insulation which are subject to certain American Society for Testing and Materials (ASTM) standards. Tests performed in this section involve the burning of these materials to measure certain properties such as flame spread and smoke density. The majority of the work in the section is performed in three rooms and involves 3-5 employees.

One room in the section houses the Steiner Flame Spread Tunnel which is used to test various building materials to determine the flame spread index and smoke density. The test specifications require the room to be temperature and humidity controlled. To conduct the tests, samples of the material are mounted with an adhesive onto asbestos boards which support the material while testing. The specimen size is 21 inches by 25 feet. The asbestos boards are placed in the tunnel by two operators. The system is then closed and the tunnel prepared for operation. Testing time varies with the material but usually requires approximately 10 minutes. During the test, the tunnel is completely enclosed and vented to the outside. After the test is complete, the tunnel is cooled down before it can be cleaned and the next specimen loaded. To clean the tunnel, the top is lifted, the asbestos boards are removed and then the burnt material is cleaned out of the tunnel using brushes. The procedure requires approximately 10 minutes. Approximately 5 samples can be tested during an 8-hour shift.

The samples for the Steiner Flame Spread Tunnel are prepared in another room. As stated previously, the material to be tested is glued onto asbestos boards. The asbestos boards arrive at U.S. Testing pre-cut to the appropriate size for use in the tunnel. The boards are covered with varying amounts of dust, probably a result of the supplier cutting the boards into the designated size. In preparing the samples, the adhesive is first applied to the material to be tested and then the material is applied to the board. The adhesive which is used may vary depending on the customer's specifications. In some instances, the customer prepares the samples, eliminating the above described procedure. No general or local ventilation is present in the room. The employee wears gloves and a respirator while preparing samples.

The third room which is part of the Fire Technology and Flammability Section contains various test apparatus, some of which are used on an infrequent basis. Two systems used are Radiant Panel Testers. The Radiant Panel Apparatus is contained in a separate room enclosure and is provided with local ventilation which is specified in the test conditions. A large wall fan is also located inside the enclosure which can be used to remove smoke or fumes from the enclosure when a test is complete. A Floor Radiant Panel Tester is located adjacent to the unit just described. This tester is located in the main room with a canopy hood over it. Again, the amount of local ventilation is specified by the testing procedure. Two laboratory hoods house several smaller test apparatuses. Also located in this area is a Smoke Density Chamber and an Ignition Tester for plastics. One system provides the local ventilation for the two hoods, Smoke Density Chamber and Ignition Tester. The room itself contains one wall exhaust fan which exhausts into an adjacent room. No other local or general ventilation is present.

#### B. Evaluation Design

A walk-through survey of the Fire Technology and Flammability Section was conducted with representatives of the company and employees on April 18, 1979.

Personal breathing zone samples for asbestos were collected on three employees on April 19, 1979. Both long term (6-7 hours) and short term (less than 15 minutes) samples were collected on 37 mm diameter cellulose ester membrane filters (pore size of 0.8 micrometers). Battery-powered personal sampling pumps provided a 1.7 lpm air sampling rate. The samples were analyzed according to NIOSH method P & CAM 239 utilizing phase contrast microscopy. In the two main testing areas, area charcoal tube samples were collected and submitted for GC/MS identification of any volatiles present. A bulk sample of dust present on the asbestos board was also collected for analysis for per cent asbestos.

Ventilation measurements were made using a thermal anemometer. All local exhaust systems were checked for air flow and intake and exhaust locations were identified.

An interim report on the findings of the evaluation was forwarded to the company and union on May 17, 1979.

#### C. Evaluation Criteria

The criteria available to assess the potential toxicity of asbestos has been under revision in recent years due to the growing evidence of serious delayed long term health effects from low level exposures. The asbestos criteria recommended by NIOSH in their "Revised Recommended

Asbestos Standard", December 1976, NIOSH Publication #77-169 is 0.1 fibers/cc (100,000 fibers/M<sup>3</sup>) for an 8-hour time weighted average (TWA) for fibers >5 µm in length. This is based on the lowest level detectable by phase contrast microscopy which is the only generally available and practical analytical technique at the present time. They also recommend the peak concentration not exceed 0.5 fibers/cc (500,000 fibers/M<sup>3</sup>) based on a 15-minute sample period. The recommended standard is intended to protect against the noncarcinogenic effects of asbestos (asbestosis) and materially reduce the risk of asbestos-induced cancer (only a ban can assure protection against carcinogenic effects of asbestos).

The existing OSHA standard of 2 fibers/cc >5 µm in length TWA and 10 fibers/cc >5 µm in length ceiling value are in agreement with the original NIOSH recommended criteria published in 1972 (HMS 72-10267). The ACGIH TLVs have been published with an intended change in 1978 to limit TWA asbestos exposures as follows: amosite 0.5 fibers/cc; chrysotile 2.0 fibers/cc; crocidolite 0.2 fibers/cc; tremolite 0.5 fibers/cc; and other forms 2.0 fibers/cc.

#### D. Evaluation Results

A review of the sample results for asbestos given in Table 1 shows asbestos concentrations ranged from non-detected to 0.41 fibers/cc. The TWA concentrations for the Flame Spread Tunnel Operators were 0.27 fibers/cc and 0.18 fibers/cc respectively. The highest concentration of asbestos was reported on the individual that prepared the samples for the tunnel. This would be expected because this individual came in contact with the dust on the boards during sample preparation as well as later when the samples were loaded and removed from the tunnel. (Analyses of a bulk sample of dust collected from the boards showed it was 10-30 percent asbestos.) While the concentrations are not in excess of the OSHA standard, they do exceed the NIOSH recommended criteria. The two "short term" samples for asbestos collected when the tunnel was being cleaned had concentrations of 0.41 fibers/cc and non-detected. These values are below both the NIOSH recommended peak concentration criteria and the OSHA standard.

Employees in the Flame Spread Tunnel area and the individual preparing samples wear gas masks with organic vapor canisters. To determine how appropriate this may be, charcoal tube samples were collected to identify any volatiles present. No compounds were detected or identified. (This does not rule out the presence of organics as they could be collected on charcoal but not removed by the method used during analyses.)

During the survey, numerous ventilation measurements were made and work practices were observed. Each section will be discussed individually.

E-84 Tunnel Sample Preparation Room - No general or local ventilation was present. In addition to the use of asbestos board, some of the adhesives which are applied in the location have warning labels that they contain eye and skin irritants.

E-84 Steiner Tunnel Test Room - The room where this test is performed is temperature and humidity controlled. The system, however, is the recirculating type, resulting in little introduction of fresh air into the room. (The air conditioning intake is also located adjacent to the afterburner for the tunnel.) As a result, any material released into the room during the testing or clean-up operations will probably remain or build up during the day. Air measurements made on the system also indicate that the system is not functioning properly. In some instances almost no air flow (less than 25 fpm) could be measured at the exhaust. Work practices also contribute to exposure in this area. Unnecessary dust is generated after the tests are complete when the tunnel is cleaned using a brush and dust pan. Employees were also observed eating in the work area.

Flooring Radiant Panel Room - This room has no source of general ventilation. A wall exhaust fan is present but it exhausts into an adjacent room and is seldom used. Several small tests are conducted in the two hoods located in this area. The hoods have hand-operated dampers. To open the dampers, the employees must open the hood sash, put their arm inside the hood and open the damper located at the top of the hood. By this time, fumes or smoke trapped in the hood have escaped into the room before the hood can perform its function. The average face velocities on the hoods were respectively 30 fpm and 12 fpm. The recommended average face velocity for a laboratory hood is 100 fpm with 50 fpm minimum velocity at any individual point. Only two points out of nine measured on each hood have velocities greater than 50 fpm. The flexible duct which provides the ventilation for the Smoke Density Chamber is poorly designed. With all the angles in the flexible duct between the chamber and the main duct, almost no air flow is provided to exhaust the chamber. A similar situation exists with the Ignition Tester for plastics. Because of the design of the ventilation system, almost no air movement is occurring. Based on these ventilation measurements and observations of work practices as well as the environmental measurements which were made, the following recommendations are being made.

## V. RECOMMENDATIONS

1. The asbestos levels measured exceed NIOSH criteria and OSHA policy requiring medical examinations of exposed employees. By the expressed terms of the law, 29CFR 1910.1001 (j) annual medical examinations are required where employees are exposed to any concentration of asbestos fibers. It is current OSHA policy to require medical examinations only when employee exposures exceed 0.1 fibers greater than 5 microns in length per cubic centimeter

based on a TWA basis or peak exposures of 0.5 fibers/cc based on a 15-minute air sample. Examinations should include chest X-rays and pulmonary function tests including forced vital capacity (FVC) and forced expiratory volume at one second (FEV).

2. A thorough check should be made of the ventilation system in the Flame Spread Tunnel Room as measurements indicate the system is in need of cleaning or for some other reason is not functioning properly.
3. The air conditioning intake for the Flame Spread Tunnel Room should not be located adjacent to the tunnel's afterburner exhaust.
4. The quantity of fresh air introduced into the Flame Spread Tunnel Room should be increased to provide for dilution of substances released into the workroom air.
5. The tunnel should be cleaned by a vacuum system only.
6. Local ventilation should be provided where the tunnel samples are prepared to reduce the exposure to asbestos and to the adhesives. It was stated that the company planned to install a canopy hood for this purpose. This type of ventilation would probably result in increased exposure as is illustrated in Figure I. The ventilation installed should pull dust away from the workers breathing zone, not past it. It would also be advisable to have a vacuum system in this area so that the asbestos-containing dust could be removed from the boards before being handled by employees.
7. General ventilation should be provided in the Flooring Radiant Panel Room.
8. The wall exhaust in the Floor Radiant Panel Room is used to help clear the room of smoke when such a situation develops. As a result, the fan should not exhaust into an adjacent work area. The fan, if used, should exhaust to the outside.
9. The exhaust system for the two hoods, Smoke Density Chamber and Ignition Tester should be redesigned to provide adequate air flow.
10. The dampers of the hoods should be changed to allow use without opening the hood sashes.
11. Employees should be able to turn on the large exhaust fan located in the enclosure in the Flooring Radiant Panel Room without entering the enclosure. Employees should be encouraged to use the fan after each test is complete and before they enter the enclosure.

12. When insulation is blown before testing, it should be performed only in the enclosure provided for that purpose, with all available measures being used to keep the dust levels at a minimum. If low dust levels are not maintained, local exhaust will be necessary in the enclosure to remove the insulation before it enters the remaining work area.

VI. AUTHORSHIP AND ACKNOWLEDGMENTS

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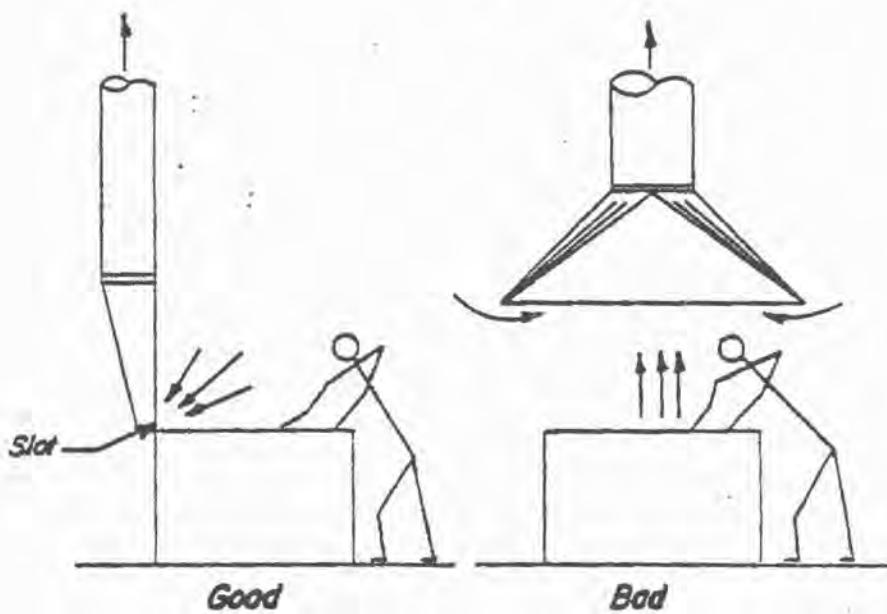
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FIGURE 1



*Good*

*Bad*

**DIRECTION OF AIR FLOW**

*Locate the hood so the contaminant is removed away from the breathing zone of the worker.*

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TABLE I

Asbestos Concentrations  
April 19, 1979United States Testing Company  
Hoboken, New Jersey

<u>Sample Description</u>	<u>Sample Number</u>	<u>Time</u>	<u>Asbestos Concentration</u> (fibers/cc)
radiant Panel Operator	1	8:40-12:05 13:00-16:25	N.D.*
lame Spread Tunnel Operator and Sample Preparer	2 6	8:40-12:07 12:54-16:25	0.41 0.14
lame Spread Tunnel Operator	3 7	8:35-12:07 12:57-15:40	0.06 0.33
lame Spread Tunnel Operator(A)	4	10:35-10:47	0.41
lame Spread Tunnel Operator(B)	5	10:35-10:47	N.D.

\*N.D. = Not Detected - Limit of Detection 4.500 fibers/filter