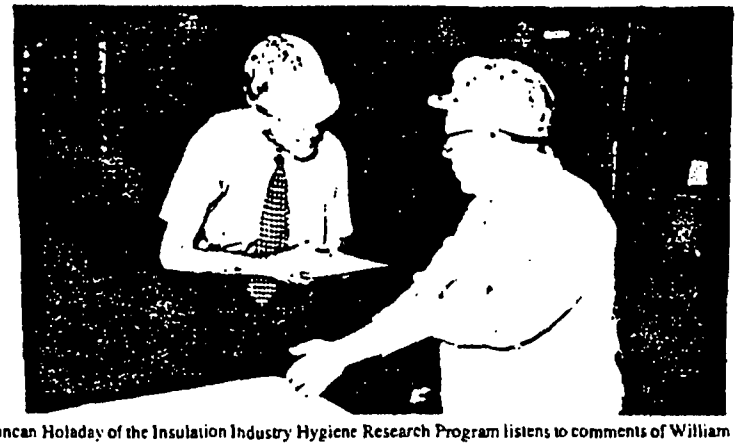
Environmental Sciences Laboratory
of The City University of New York

INSULATION HYGIENE PROGRESS REPORTS

FROM THE INSULATION INDUSTRY HYGIENE RESEARCH PROGRAM

Irving J. Selikoff, M.D., Program Director

Vol. 5 No. 3 Fall 1973



Duncan Holaday of the Insulation Industry Hygiene Research Program listens to comments of William Carlisle of Local 42 on the suitability of disposable overalls.

Asbestos Workers Like Disposable Overalls

Field trials by members of Local 42, Wilmington, Delaware, of the International Association of Heat and Frost Insulators and Asbestos Workers have shown that well made disposable overalls are the most acceptable and suitable means of preventing asbestos contamination of work clothes.

The trials were made on June 5, 1973 of garments made of E. I. Dupont de Nemours and Company's Tyvek material. Tyvek is an extremely durable synthetic material that can easily be sewn into garments of any desired style.

Through arrangements made by Rodney Santa Barbara, Business Agent of Local 42, wear tests were conducted and worker interviews obtained at a nearby power plant construction site. The overalls of the Tyvek material were supplied through the cooperation of Mr. H. Glenn White of Dupont's Textile Fibers Department. The tests were conducted by Duncan Holaday and Dr. William J. Nicholson of the Insulation Industry Hygiene Research Program.

The results of the trial indicated that over 80% of the workers interviewed preferred the use of the Tyvek overalls, supplied by the employer, to the use of any other type of work clothes that required laundering at home.

One problem encountered in these tests, and one that confronts the use of any overgarment, is that overalls can be too hot to wear during summer months or during work on or near hot lines. In the Wilmington trials the temperature reached 94° with an accompanying high humidity. Under these conditions most of the men found the overalls too hot. However, these conditions were extreme and during most of the year temperatures would be more suitable for the use of the overalls.

Disposable overalls have been discussed in prior issues of *Insulation Hygiene Progress Reports* and they have been widely used in some industries. However, there were drawbacks in those which were available. They

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Approved Respirators Highly Effective

Tests conducted by the Insulation Industry Hygiene Research Program on the three disposable respirators recommended for use by insulation workers have demonstrated that all three are highly effective in filtering asbestos fibers.

The tests were conducted by generating a dust cloud of asbestos cement containing over 50% chrysotile fiber in an aerosol chamber at the Haskell Laboratory of the E. I. Dupont de Nemours Company in Wilmington, Delaware.

The asbestos concentration in the chamber exceeded by several hundred times those typically encountered in insulation work. Air from this chamber was drawn through sections of the filter material cut from the following respirators:

3 M Company Model 8710
Welsh Mfg. Co. Model 7165
American Optical Co. Model R1050

In all cases the filter materials proved to be at least 99.9% efficient.

Both optical microscopic and electron microscopic analysis were performed on a sample of the air which passed through the filters. These analyses checked the effectiveness of the filters for even the smallest of asbestos fibers.

These tests conducted by the IIHRP are important, as the Bureau of Mines uses only silica and coal dust in their approval tests. It has always been assumed that the collection efficiency for asbestos fibers would be as great as for silica. We now know that it indeed is.

While we know the filters to be

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Insulation Hygiene Progress Reports

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from the

Insulation Industry Hygiene Research Program

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PURPOSES OF THE INSULATION INDUSTRY HYGIENE RESEARCH PROGRAM

1. To develop improved methods for minimizing exposure of insulation workers to dusts and fumes encountered in their work.
2. To disseminate knowledge of these improved methods of dust control wherever they may be applied advantageously and to offer cooperation, advice and assistance toward their universal adoption.

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highly efficient in the respirators tested, the face seals that can be obtained are much less effective. These respirators passed an approval schedule that required only 90% of the dust to be excluded by the face seal. Your choice of a respirator should thus be based on the fit that can be achieved on your face and comfort during use. You don't have to worry about fibers penetrating the filter.

Mrs. Anne Mackler of the Environmental Sciences Laboratory of Mount Sinai School of Medicine collecting settled dust from the stairway near which asbestos contaminated work clothes were hung in this home. Above her shoulder is located an air sampling unit.

Household Contamination is a Serious Problem

Control of insulation dusts on the job site is necessary to protect, not only insulation workers, but also members of their families.

Special concern for the family members of insulators has recently developed because of the finding of a lung tumor in the nine year old daughter of a New Jersey Union member. The tumor was localized and successfully removed by surgery.

Asbestos Found in Lung

Electron microscopic analysis at the Environmental Sciences Laboratory of Mount Sinai School of Medicine of the tissue removed from the lung showed significant amounts of chrysotile asbestos and diatomaceous earth to be present, much in excess of what is typically found in a child of nine. Both chrysotile and diatomaceous earth are common components of insulation material.

The existence of the tumor and the finding of insulation material in the lung in this isolated case does not demonstrate that these fibers and particles necessarily caused the tumor. Chrysotile asbestos, albeit in lower amounts, is found in the lungs of many individuals, children, as well as adults, who have had no direct or indirect association with asbestos products.

Nevertheless, because of the rarity of such tumors in children, this particular case does give one pause. It was a similar single isolated case of lung cancer described in the medical literature in 1935 that first pointed to the risk of such disease in asbestos workers.

Air Samples Collected

Samples of the air and specimens of settled dust from the room of the child and elsewhere in the home were collected by Mrs. Anne Mackler and Dr. Arthur Rohl of the Environmental Sciences Laboratory. The analysis of these samples showed significant amounts of asbestos to be present in the child's bedroom and in the basement play area near where the husband's work clothes were hung and where these clothes were laundered.

In a more extensive sampling program of a variety of asbestos workers' homes, including those of mill workers, asbestos has universally been found to be present, usually in concentrations much higher than those of the above case. Chrysotile air concentrations may range from 100 times to over 1000 times those found in general city air.

High Dust Levels Found in Homes

While these home concentrations are high, the dust levels are still much less than those in occupational circumstances. However, since the exposure of people at home can be for longer periods of time, elevated levels may be important.

Children at Risk

Children may be especially at risk from low level asbestos contamination. The fibers that enter their lungs at an early age can remain in their tissues to do damage throughout their lifetime. Moreover, the possibility cannot be ruled out that tissues of children, especially infants, may be more sensitive than those of adults.

Two reports in the medical literature have also indicated the existence of a health hazard to the family members of asbestos workers. In a 1965 study of all cases of mesothelioma found in the pathology files of the London Hospital, Dr. Muriel Newhouse found that 12% (nine of 76) of the cases were in members of families of individuals who worked with asbestos.

The usual history of these family mesothelioma cases was that of a wife who washed her husband's work clothes. Similar results were found in the United States by Drs. J. Lieben and H. Pistawka who described three family cases of mesothelioma in Pennsylvania, one of which was in a three year old child of an engineer who worked in an insulation plant.

Chrysotile asbestos fibers found in the home air of an asbestos worker. The fibers are magnified 7000 times here.

Diatomaceous earth found in the settled dust of the home of an insulator. The photograph is magnified 7000 times.

In each of the above studies cases were also found in individuals who simply lived in the neighborhood of asbestos manufacturing facilities.

Because mesothelioma is such a rare disease in the general population the documentation of these cases has taken on special significance. In the absence of any direct or indirect asbestos exposure, mesothelioma may be the cause of death in one in 10,000 deaths. In insulation workers and asbestos factory workers nearly one death in 15 is from mesothelioma.

These data, the rarity of mesothelioma in the general population and the strong association with asbestos exposure, have allowed scientists to attribute these family and neighborhood cases to a low, but unknown, level of asbestos exposure.

While the information is absent on the air concentrations at which asbestos disease may occur, it is clear that mineral fiber do no good in human lungs. Every precaution should be taken to prevent their inhalation.

Chrysotile asbestos fibers (C) and a fragment of diatomaceous earth (DE) found in the tissue of an insulation worker's daughter who had a lung tumor removed.

At the present time the asbestos insulation worker receives little help in his attempts to prevent asbestos contamination from being carried home. The results of the survey of insulation workers on the health practices in the industry show that approximately 40% of the men work on job sites with no facilities for clothes change available. Between June 7, 1972 and December 6, 1972 only 25% of more than 5,000 Union members routinely had such facilities. (See Table.)

Procedures Available

Procedures for preventing the undesired movement of materials from the job site to the home are well-known and have been in use for many decades in some industries. In gold and uranium refineries, for example, very effective decontamination procedures are used to prevent dust from being carried home on workers' clothes.

In some shipyards and asbestos production plants in Great Britain a double locker system is used. All street clothing (including shoes) is deposited in one locker in a clean room and all work clothes kept in a locker in a separate room. Access to the clean room and a workman's street clothes is only through a shower facility. Periodically all contaminated work clothing is removed from the dirty room and laundered in special facilities.

These provisions are indeed effective but are not suitable on most construction sites or other transient operations. While less ideal measures must be used, the most important item in preventing spread of contamination is to confine the dust to the job site. *If it*

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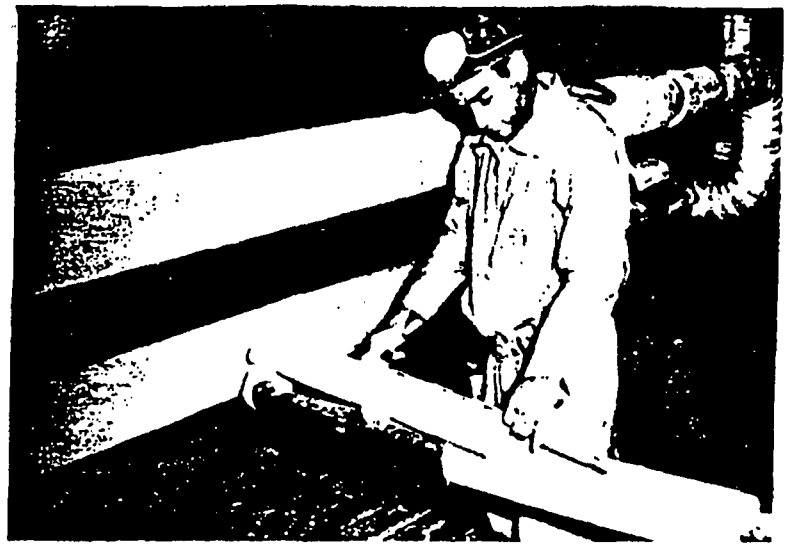

Jack Stevenson participating in the field trials of disposable overalls held in Wilmington, Delaware on June 5.

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tore easily, if they were inexpensive, or if durable, they were costly.

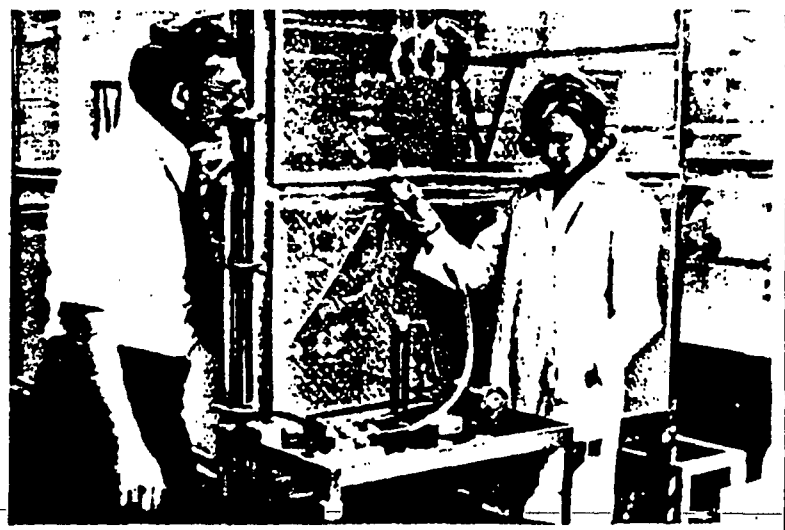
This problem no longer exists. A variety of manufacturers make disposable overalls of Tyvek and typical costs are about $1.50 per garment. Moreover, there was little problem with the material tearing in the garments tested. Thus durable, disposable overalls can be obtained at a cost of less than 2% of that of the employer's wage costs. If uniformly made available by contractors in an area, such costs can simply be included in any contract estimate.

Laboratory tests also indicated the suitability of Tyvek overalls for insulation work. Tests were conducted by IIHRP and Dupont personnel at Dupont's Haskell Laboratory for Industrial Hygiene and Toxicology to measure the penetration of asbestos fibers through Tyvek and other material and to determine the adhesion of fibers to the material.

The results of these laboratory tests showed the Tyvek material to be relatively resistant to the penetration of asbestos fibers from insulation material. Moreover, in contrast to wool or cotton garments, it was found that asbestos fibers will not readily adhere to Tyvek garments.

One disposable overall has been tested and found suitable under appropriate temperature conditions. Others, perhaps equally suitable, may also exist. While not the perfect answer to the problem of bringing asbestos and other insulation dusts home on work clothes, disposable overalls are the most practical solution at this time. What now must be accomplished is to make their availability widespread.

As the temperature mounted to 94° during the field trials of the disposable overalls some soon became indeed disposable.



Glenn White and Constance Eddy of E. I. Dupont de Nemours and Company participating in the laboratory test of the overall material.

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doesn't even reach the change area, it isn't going any farther.

The best available way to accomplish this is for workmen to wear coveralls which can be removed on the job and disposed of with other construction waste. This practice, together with the availability of change rooms and strict attention to their clean up, will go far towards eliminating household contamination.

Asbestos Worker Questionnaire Replies

Facilities and supplies for clothes change were available:

All the time (100%)	1291
Usually (50-75% of the time)	940
Occasionally (1-49% of the time)	872
Never (0%)	1964

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