WALK-THROUGH SURVEY REPORT:

CONTROL TECHNOLOGY FOR ASBESTOS REMOVAL INDUSTRY

AT

TIDEWATER PARK ELEMENTARY SCHOOL
NORFOLK, VIRGINIA

REPORT WRITTEN BY:
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NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
Division of Physical Sciences and Engineering
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PLANT SURVEYED:	Norfolk Public Schools Systems Tidewater Park Elementary 1045 East Brambleton Avenue Norfolk, Virginia 23504
SIC CODE:	1799
SURVEY DATE:	July 25, 1984
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I. INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) is the primary Federal agency engaged in occupational safety and health research. Located in the Department of Health and Human Services (formerly DHEW), it was established by the Occupational Safety and Health Act of 1970. This legislation mandated NIOSH to conduct a number of research and education programs separate from the standard setting and enforcement functions carried out by the Occupational Safety and Health Administration (OSHA) in the Department of Labor. An important area of NIOSH research deals with methods for controlling occupational exposure to potential chemical and physical hazards. The Engineering Control Technology Branch (ECTB) of the Division of Physical Sciences and Engineering has been given the lead within NIOSH to study the engineering aspects of health hazard prevention and control.

Since 1976, ECTB has conducted a number of assessments of health hazard control technology on the basis of industry, common industrial process, or specific control techniques. Examples of these completed studies include the foundry industry; various chemical manufacturing or processing operations; spray painting; and the recirculation of exhaust air. The objective of each of these studies has been to document and evaluate effective control techniques for potential health hazards in the industry or process of interest, and to create a more general awareness of the need for or availability of an effective system of hazard control measures.

These studies involve a number of steps or phases. When the perceived need for research requires further definition, a pilot study is undertaken to assess the need for bench research and/or validation of existing capabilities. If it is determined that field studies are needed, a series of walk-through surveys is conducted to select plants or processes with effective and potentially transferable control concepts or techniques. Next, in-depth surveys are conducted to determine both the control parameters and the effectiveness of these controls. The reports from these in-depth surveys are then used as a basis for preparing technical reports and journal articles on effective hazard control measures. Ultimately, the information from these research activities builds the data base of publicly available information on hazard control techniques for use by health professionals who are responsible for preventing occupational illness and injury.

The objective of this pilot study is to determine the state-of-the-art of asbestos removal control technology and to what extent it has been successfully applied in various industries. It will provide an assessment of the need for research and/or validation of existing capabilities and their potential for transfer to other industries. The purpose of this visit was to explore the use of this technology in the asbestos removal industry.

BACKGROUND

Interscience Research, Inc., came to the attention of this investigation through the participation of Mr. Marshal Marcus, C.I.H., in the EPA/NBS Workshop on Asbestos Clearance Criteria on March 12 and 13, 1984. It was learned that he is a consulting member of this group. After extended conversations with Mr. Marcus and Dr. Guth, it was decided to observe some work being done under a contract specification written by Mr. Marcus and Dr. Guth and carried out under the surveillance of Interscience Research. The Norfolk Schools were in final stages of completing this year's work and offered such an opportunity.

Mr. Mayo and Mr. Jezerski of the Norfolk Public School system attended a 3-day American Wall and Ceiling Institute training program on asbestos removal to prepare for the development of an asbestos plan. After taking this Manager's course, they recognized the need for professional expertise to accomplish the school system survey and to write specifications for work. This task was let out for bid in March of 1983 with the goal of producing specifications for work to begin in June of 1983. They chose Interscience Research, Inc., and Mr. Marshal Marcus, C.I.H., was assigned the project.

The information in this section was in part extracted from the June 1983 Interscience Research, Inc. report NORFOLK PUBLIC SCHOOLS 1983 SURVEY.[1] The purpose of that study was to provide a complete picture of the potential for asbestos exposure in Norfolk City Schools. The initial survey of Norfolk's 61 schools identified asbestos in 57 facilities. The average age of Norfolk schools is 37 years, making it the largest collection of old school buildings in Virginia. The survey included analysis of over 400 samples. Four-factor Sawyer algorithms were used to calculate guidance numbers.[2] In general, these scores can be used to rank the relative degree of potential for release of fibers from friable asbestos-containing material from one location to another. However, guidance numbers cannot be depended upon for exact rankings if factors other than the four D.O.E. considered (condition of material; proportion of the material exposed; friability; and total asbestos content) affect fiber release. After applying the guidance system, the evaluator's objective is to determine whether a management system or direct corrective action is appropriate. The guidance system does not determine the type of action required. The choice of removal, encapsulation, or enclosure will be determined by a number of other factors, not explicitly included in the ratings system, that will influence the action decision. The experience of the evaluator in asbestos control work is the most important factor in determining priorities and corrective action in practice. The final decision by school officials on what action to take is governed by their judgment of how reasonable the recommended priorities are, and the time and money available.

Based on this very thorough assessment, recommendations were made on priorities for corrective action including a schedule for corrective action over a period of five years with removal cost estimates. The project that the school system implemented is a 5-year removal and renovation plan costing approximately 5 million dollars. Three of the six buildings requiring removal work are to be completed the summer of 1984. Interscience Research, Inc., prepared the contract specifications and is acting on behalf of the school system monitoring the contracts. We received copies of their survey report and of the contract specifications for 1983 and 1984.[3]

The approach taken in the conduct of these removal contracts is to combine a very strict set of specifications with a high standard of competency for bidding eligibility in order to ensure qualified contractors are selected. The contract proceeds under direct surveillance of an industrial hygienist who has approval authority. This management approach is essential to achieving good performance. The specifications are stringent in a number of ways. Fundamental to them is the industrial hygienist's use of scanning electron microscopy (SEM) to augment phase contrast microscopy (PCM) in assessing (a) the degree of control and the degree of respiratory protection required, (b) the adequacy of the containment, and (c) the adequacy of decontamination for final clearance purposes. The use of EM analysis for initial site and worker exposure evaluation and final clearance is based on the fact that Interscience has found ratios of thin fibers not visible optically to thick optically visible fibers ranging from 3:1 to as high as 18:1. The presence of thin long fibers (less than 0.2 um dia and greater than 5.0 um long), which are undetected by PCM, in a ratio greater than 3:1 requires more extensive use of the SEM for respirator selection. The selection criteria calls for no more than 0.1 f/cc (total asbestos fibers by SEM/EDX) inside the mask based on a table of protection factors. Single use disposable respirators are not permitted. Area monitoring in surrounding areas will not exceed 0.01 f/cc by PCM or the level prior to work startup by SEM. For final clearance, SEM fiber counts must be equal to, or less than 0.01 f/cc or the fiber counts before work began, whichever is less, based on prework SEM sampling.

II. SITE AND PROCESS DESCRIPTION

Site Description:

The Tidewater Park Cafetorium had an asbestos-coated vaulted ceiling. The Norfolk Public Schools 1983 survey identified 5,110 square feet of 17% chrysotile. The reported guidance number was 23.4, with a priority ranking of 9 and the recommended action was removal in 1984 at an estimated cost of $30,700. The observation was made that 46 dents, scrapes, and gouges were counted. Most appeared to be from scaffolds during light maintenance. If these maintenance practices continue, removal was recommended. The containment area was still under negative pressure and the mobile trailer, which Tidewater Insulation had customized for a three compartment decontamination facility, was still in use.

Process Description:

Asbestos removal was completed earlier in the week. The high bay vaulted ceiling had presented a problem both in controlling release of fibers from falling debris and in providing air circulation for employee exposure control. The method described which made provisions for both is included in this report under engineering controls.

This facility was ready for final visual inspection and clearance monitoring prior to removal of the containment barriers. Dust respirators and disposable coveralls were worn during the inspection and placement of samples. The visual inspection technique was noteworthy. After an initial walkaround to assure that no larger accumulations of debris had been left, the inspector used two flashlights to aid in observation of surface cleanliness. The flashlights were layed on the surface being inspected with their beams tangential to the surface and at right angles to each other. This configuration was then swept across the surface thereby highlighting even minute dust accumulation on the surface. The inspector will determine, based on his experience, whether he believes the area is ready for clearance sampling.

Potential Hazards:

The carcinogenic potential of asbestos is no longer in doubt; however, there is some uncertainty about the toxicological and morphological properties which determine the carcinogenicity of various fibers. NIOSH believes that on the basis of available information, there is no scientific basis for differentiating between asbestos fiber types for regulatory purposes.

NIOSH has recommended that asbestos be controlled to the lowest detectable limit. It is our contention that there is no safe concentration of exposure to asbestos. Any standard, no matter how low the concentration, will not ensure absolute protection for all workers from developing cancer as a result of their occupational exposure: However, lower concentrations of exposure carry lower risks. /

NIOSH continues to believe that both asbestos and smoking are independently capable of increasing the risk of lung cancer mortality. When exposure to both occurs, the combined effect, with respect to lung cancer appears to be multiplicative rather than additive. From the evidence presented, we may conclude that asbestos is a carcinogen capable of causing, independent of smoking, lung cancer and mesothelioma.

Data available to date provide no evidence for the existence of a threshold level. Virtually all levels of asbestos exposure studied to date demonstrated an excess of asbestos-related disease.

III. CONTROLS

PRINCIPLES OF CONTROL

There are two health-related objectives of asbestos control. One is to protect the public from a hazardous pollutant. The other is to reduce or eliminate worker exposures. It is often the case that the most effective means of achieving one of these objectives may cause difficulties in meeting the other. These two objectives must be met by an integrated approach to the control solution.

Worker Protection Controls:

Occupational exposures can be controlled by the application of a number of well-known principles, including engineering measures, work practices, personal protection, and monitoring. These principles may be applied at or near the hazard source, to the general workplace environment, or at the point of occupational exposure to individuals. Controls applied at the source of the hazard, including engineering measures (i.e., material substitution, process/equipment modification, isolation or automation, local ventilation) and work practices, are generally the preferred and most effective means of control both in terms of occupational and environmental concerns. Controls which may be applied to hazardous agents that have escaped into the workplace environment include dilution ventilation, dust suppression, and housekeeping. Control measures may also be applied near individual workers, including the use of remote control rooms, isolation booths, supplied-air cabs, work practices, and personal protective equipment.

In general, a system comprised of the above control measures is required to provide worker protection under normal operating conditions, as well as under conditions of process upset, failure, and/or maintenance. Process and workplace monitoring devices, personal exposure monitoring, and medical monitoring are important mechanisoms for providing feedback concerning effectiveness of the controls in use. Ongoing monitoring and maintenance of controls to ensure their proper use and operation, and the education and commitment of both workers and management to occupational health are also important ingredients of a complete, effective, and durable control system.

These principles of control apply to all situations, but their optimum application varies from case-to-case. The application of these principles in the Tidewater Insulation Company asbestos removal process is discussed below.

OBSERVATIONS

Engineering Controls:

The containment barrier control method recommended by EPA guidelines was in use at this facility. A HEPA exhaust system "Negative Air" was also used to control emissions. The contractor developed a means of reducing contamination from falling debris and providing clean air for the workers at ceiling level. A catchment chute was rigged from plastic sheeting on the side of the rolling scaffold platform to funnel the falling asbestos into bags below. A MicroTrap

HEPA filtration unit was mounted on the lower stage of the scaffolding and a flexduct was run up behind the removal worker to discharge cleaned air over his shoulder and purge the breathing zone. This method was reportedly very successful in keeping the breathing zone fiber levels low.

Work Practices:

It is common practice to allow asbestos to fall to the floor and accumulate for later disposal. The control of debris to avoid excessive contamination and reintrainment is well advised. The process reported to have been successful at this site was not observed, however, it is described in the engineering control section.

Monitoring:

Clearance monitoring was initiated with two MICRO-MAX high volume air sampling stations, one with a standard 37 mm 0.8 u celulose ester open-faced cassette for PCM analysis and the other a 37 mm 0.4 u nuclepore open-faced cassette for SEM analysis. The specifications require these pumps to draw 2,400 liters of air through each sample at 10 to 20 lpm.

Personal Protection:

Initial removal activity on each site required use of Powered Air Purifying Respirators (PAPRS) with HEPA filtration. For initial site preparation and during later phases of removal, workers wore disposable coveralls and half-face cartridge respirators. A walk-through decontamination trailer with showers were located at the entrance to the enclosure.

Other Observations:

Mr. Holloway was most enthusiastic about operating under the unusual and tightly controlled specifications which Interscience Research had written. He has a small business employing about 10 removal workers. He had been somewhat apprehensive at first about meeting the control criteria using SEM analysis. However, he learned that these tighter criteria were achievable and necessary for safe operation. He had just received clearance from another site (St. Helena School), which he had worked under the same specifications. At that facility, it was discovered during the first period of air monitoring that the ratio of thin fibers to thick fibers was unusually high (18:1) compared to a more common 3:1. This required a very aggressive fiber control and cleanup effort. However, he was pleased to learn his clearance sample was 0.001 f/cc by SEM analysis. The prework background sample had been 0.002 f/cc. Mr. Holloway indicated that he had a policy of keeping the same work crew and that he always bids jobs with higher standards of performance. This would ensure that their work practices and training would not be adversely affected by lesser performance criteria. He expressed a wish that all of the projects would have specifications like Interscience Research put out.

IV. CONCLUSIONS AND RECOMMENDATIONS

This contractor's experience with this tight fiber control, SEM monitoring, and IH surveillance system is noteworthy. He represents a large fraction of the industry which are smaller businesses unable to employ the type of professional expertise which is manifested in the Interscience approach.

While a standard sampling and analytical protocol for SEM analysis has not been established, it should be noted that there are some limitations to the use of nuclepore filters. Significant losses have been shown to occur when nuclepore filters with pore diameters exceeding 0.2 um are used for air sampling.[4] It was generally recognized at the EPA/NBS Workshop of March 1984 that the 0.4 um pore size was preferable to the 0.8 um. There were also comments regarding the potential losses from static electric caused clinging of fibers to the cassette walls and fiber migration in transit. It may be preferable to use a method of direct transfer for the Cellulose ester filters as outlined in the Burdet paper.[5]

This particular location did not employ any of the removal technologies (local ventilation, glove bags, or injection wetting) that are currently of interest for in-depth study. Should this contractor be involved with any of these techniques, they would be a candidate for in-depth study.

V. REFERENCES

1. Marcus, Marshal H. 1983. Norfolk Public Schools 1983 Survey. Interscience Research, Inc. Norfolk, Virginia. Volumes 1 and 2.

2. Department of Energy. D.O.E. Rating Method. 46 CFR 4544.

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5. Burdet, Garry J., and Anthony P. Rood. 1983. Membrane-Filter, Direct-Transfer Technique for the Analysis of Asbestos Fibers or Other Inorganic Particles by Transmission Electron Microscopy, American Chemical Society, Environmental Science and Technology 17-11:643-649.