WALK-THROUGH SURVEY REPORT:

CONTROL TECHNOLOGY FOR ASBESTOS REMOVAL INDUSTRY

AT

JAMES MONROE 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 James Monroe Elementary School 2910 Newport Avenue Norfolk, Virginia 23508
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. Jeroderski 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 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 60 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:

James Monroe Elementary appeared to be one of the older schools in the system. The Norfolk Public Schools 1983 survey identified 1,044 square f t and 154 linear feet of chrysotile and/or amosite asbestos-containing mate als ranging from 70% to 15% asbestos. James Monroe Boiler Room received guid ce number ratings from 34 to 60. The priority ranking was #5 with recommend action of removal in 1984 at an estimated cost of around $32,000.

Process Description:

The activity observed was the later portion of asbestos removal from the boiler room equipment in this school. Removal of most of the boiler insulation had already been accomplished. Pipe lagging, boiler ends, and ir duct insulation were removed during this visit. The work area was contai d, showers and a clean dressing area were provided, workers wore contaminati control coveralls and dust respirators.

Potential Hazards:

The carcinogenic potential of asbestos is no longer in doubt; however, th e is some uncertainty about the toxicological and morphological properties ich determine the carcinogenicity of various fibers. NIOSH believes that on e 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 detectabl limit. It is our contention that there is no safe concentration of expos e to asbestos. Any standard, no matter how low the concentration, will not ensure absolute protection for all workers from developing cancer as a re lt of their occupational exposure: However, lower concentrations of exposur carry lower risks.

NIOSH continues to believe that both asbestos and smoking are independent capable of increasing the risk of lung cancer mortality. When exposure t both occurs, the combined effect, with respect to lung cancer appears to 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 thresho level. Virtually all levels of asbestos exposure studied to date demonst ted 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 East Coast Insulation asbestos removal process is discussed below.

OBSERVATIONS

Engineering Controls:

The containment barrier control method recommended by EPA guidelines was in use at this facility. The containment area was under negative pressure from a HEPA MicroTrap exhaust unit. Magnehelic gauges, with full scale of 1.0 inch of water, were not able to detect a steady 0.2 inch negative pressure across the barrier, which is called for in the specifications. The instrument's instability and poor sensitivity at this low range may be at fault. However,

it was also noted that there were a full 2.0 inches of water showing on the Micro Trap Magnehelic and the prefilter appeared to be dirty. Micro Trap indicator lights were not working. Wet removal procedures were used and water was applied liberally. The extent of water on floors in this area made the use of ground fault circuit interupters essential to safe operation of sumps, vacuums, and lights.

Work Practices:

Workers must climb extensively to reach areas over boilers and behind ducts. Chicken wire used as reinforcement presents a difficult problem for removal and increases the potential for dust generation.

Monitoring:

Interior and exterior monitoring was in progress with battery-powered sampling pumps and standard 37 mm open-faced cassettes. Interscience provided 24-hour turnaround on PCM analytical support and SEM analysis were performed by Electron-Microscope Services Laboratory. The practice is to provide personal short-term and TWA samples, area monitoring in each active removal area and also exterior area samples at the HEPA exhaust daily.

Personal Protection:

Any dry removal approved by the hygienist requires Type C respirators. 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. Walk-through decontamination showers were located at the entrance to the enclosure. The presence of water and wire made use of substantial boots a necessity and substantial gloves most desirable.

Other Observations:

NIOSH collected three sets of area samples for use in SEM method development. It was observed that there were limitations on the maximum flow rate obtainable through the 0.1 u Nuclepore filters with Dupont 2500 pumps. Typically, 1.2 lpm for 3 hours was sustained.

IV. CONCLUSIONS AND RECOMMENDATIONS

The removal activity in this very difficult environment was notable. Wetting was aggressive. However, workers were also required to be more forceful in removing wire-reinforced insulation. Furthermore, the close quarters above and around piping and equipment made repeated physical contact unavoidable with a high degree of contamination. This type of removal work certainly deserves scrutiny to determine the most effective control techniques.

On the day of this survey, it is likely that the negative air control system was not working at peak efficiency. It is recommended that more emphasis be placed on maintenance of this equipment.

It is also recommended that whenever air-purifying respirators are used for where asbestos exposure may occur they be equipped with high efficiency filters. While this is not yet required by OSHA and the dust/mist cartridges in use are technically "certified" by NIOSH for use with asbestos, this is a deficiency in the regulatory system which is under revision. Dust/Mist filters are "certified" for protection under a certification criteria for fibrogenic dust. While asbestos is fibrogenic, it is now known to also be carcinogenic, which requires that a more cautious certification criteria be employed. NIOSH stated, in their June 21, 1984, testimony at the OSHA Asbestos Standard hearings, that they do not recommend the use of dust/mist respirators where exposure to asbestos may occur on the basis that such is not a prudent occupational health risk.

Additional in-depth work with this contractor is not recommended unless technologies of current interest to the study (glove bags, injection/wetting, local ventilation) are used.

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.

3. Norfolk Public Schools. INVITATION TO BID ASBESTOS REMOVAL OF FRIABLE MATERIALS BID #134, APRIL 10, 1984. Norfolk Public Schools, 966 Belmore Avenue, Norfolk, Virginia 23504.