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

HAZARD EVALUATION AND TECHNICAL ASSISTANCE REPORT NO. TA 79-41 CHICAGO AIR ROUTE TRAFFIC CONTROL CENTER AURORA, ILL

NOVEMBER, 1979

Study Requested by: Federal Air Surgeon
DOT-FAA
Washington, D.C.

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I. SUMMARY

NIOSH investigators have determined that the sprayed-on insulation material above the false-drop ceiling (attic) over the control room of the Chicago Air Route Traffic Control Center contains 50 to 80% asbestos in a friable form. Bulk samples were collected from intact, as well as loosened or fallen material. Samples of ledge dust collected above the consoles within the control itself did not contain asbestos.

Samples of the "intact" sprayed-on insulation material in the attic above the computer section of the center indicated 1 to 2% asbestos content.

General room air samples collected within the control room, as well as in the attic above, did not indicate general airborne asbestos concentrations of consequence.

Day-to-day functions within the center should not produce employee exposures to airborne asbestos fibers above the currently recognized exposure limits; however, non-routine functions such as maintenance work in the attic area or renovation or remodeling procedures could expose employees to elevated levels of asbestos, possibly exceeding recommended levels. Suggestions with respect to the problem of control of asbestos exposure to personnel within ARTCC during renovation or asbestos removal procedures are addressed in the conclusions and recommendation section of this report.

II. FACILITIES DESCRIPTION

The Chicago Air Route Traffic Control Center (ARTCC) is one of several Department of Transportation - Federal Aviation Administration (DOT-FAA) regional air traffic control centers in the United States for the purpose of directing the traffic of airborne craft.

The facility employs more than 700 persons of which the majority are traffic controllers. The facility never closes.

III. INTRODUCTION AND BACKGROUND

On June 13, 1979, the Federal Air Surgeon, AAM-1, of the Department of Transportation (DOT), Federal Aviation Administration (FAA) requested the Director of the National Institute for Occupational Safety and Health (NIOSH) to determine whether any asbestos was present in the Chicago Air Route Traffic Control Center (ARTCC) in Aurora, Illinois. Previous investigations had produced what was determined to be conflicting and inconclusive results by the Professional Air Route Traffic Controllers Organization (PATCO). Two private consulting organizations had previously been contacted to make this determination.

The friable material was spray-applied to the underside of concrete roof of the structure in an attic area over the working portion of the building. The attic area contains the ventilation system for the facility and has a series of grated walk-ways for maintenance personnel. An original drop ceiling below the grating-floor has a subsequent drop-ceiling below it, but the original remains in place. This second drop-ceiling is about 30 feet above the control room floor.

Due to water damage and wear and tear, the friable material has become dislodged over most of the control room attic roof. The "newer" sprayed on material over the computer room attic is thoroughly intact.

Also, due to water damage, the second drop-ceiling in the control room is stained and the FAA desires to replace it with new panels. Much of the loosened-deposited friable material lays atop of those ceiling panels.

IV. STUDY DESIGN AND METHODS

On June 28, two NIOSH Investigators visited ARTCC. A short briefing and walk-through was conducted. Subsequently, eight general environmental air samplers were put in place to determine airborne concentrations of asbestos fibers in all areas of concern (in the control room, in the attic above the control room and inside of two of ventilation units, before and after filtering of the recycled air) - as well as "control samples" remote to the control room environment. One additional air sample was collected to represent a short term (15 minute) exposure to the investigator (or other person) as they move about in the attic above the control room. In addition, bulk samples of friable material was collected in ten separate locations above and within the control room itself. The material collected for analysis was from intact, damaged, deposited and/or transient depositions.

The air samples were collected on mixed cellulose ester

membrane filters using personal air samplers operating at a flow rate of 1.5 to 1.75 liters per minute. The samples were analyzed according to NIOSH METHOD P&CAM 239 using phase contrast microscopy[1].

The minimum sensitivity for the air sampling and analysis performed was 4500 asbestos fibers per filter.

The bulk samples were analyzed by a visual estimation of the percentage of asbestos utilizing polarizing and dispersion staining techniques.

V. EVALUATION CRITERIA AND TOXICITY DATA

A. Toxicity Data

Asbestos is a generic term which is applied to a number of naturally occurring silicates of variable composition, but basically is of a form of hydrous magnesium silicate. Asbestos' chief characteristic is a structure composed of long, parallel, flexible fibers, capable of repeated longitudinal subdivision. The most widely used form in the United States is chrysotile, a fibrous form of serpentine. Other types include amosite, crocidolite, tremolite, anthophyllite and actinolite[2].

One of the potential health hazards associated with exposure to asbestos is that of inhalation of airborne fibers, resulting in a type of pneumoconiosis referred to a asbestosis[2]. Asbestos fibers are capable of passing through the upper respiratory tract and depositing in the terminal bronchioles of the lungs. The fibers, upon deposition in the terminal bronchioles, initiate a tissue response which results in the coating of the fiber with the ultimate production of what is known as the asbestos "body." If large quantities of the fibers are inhaled over a prolonged period, the tissue reaction progresses until a generalized, diffuse fibrosis becomes evident. This fibrosis is first seen in the lower lobes of the lungs, but eventually if exposure continues, appears in the other lobes as well. The fibrosis can impair the transfer of oxygen across the alveolar membrane and result in respiratory insufficiency, or cardiac failure.

Along with asbestosis, studies have provided conclusive evidence that exposure to asbestos fibers causes cancer in man. The frequency of bronchiogenic cancer is greater in occupationally exposed persons, as is an increased occurrence of mesotheliomas of the pleura and peritoneum. These asbestos associated neoplasms may occur without radiological evidence of asbestosis. The effects of inhaled asbestos fibers are

potentiated by smoking and possibly other environmental agents.

B. Environmental Criteria

The NIOSH recommendation for environmenmtal exposure limit is 100,000 fibers per cubic meter over 5 microns TWA (time weighted average); 500,000 fibers per cubic meter over 5 microns ceiling (15-minute)[3].

In the case of asbestos, as a carcinogen, NIOSH recommends the lowest reliably measurable level. This should adequately protect workers from non-malignant effects.

The current OSHA environmental standard is 2,000,000 fibers per cubic meter (8-hr. TWA); 10,000,000 fibers per cubic meter ceiling.

Occupational health exposure limits for individual substances are generally established at levels designed to protect workers occupationally exposed on an 8-hour day, 40 hour per week basis over a working lifetime.

VI. RESULTS AND DISCUSSION

No asbestos was detected in any of the bulk samples collected within the control room itself from ledge dust and other visual deposits above and around the consoles. Samples taken of the friable material from various locations in the attic above the control room two false ceilings showed asbestos contents of from 50 to 80%. One to two percent asbestos was detected in the material in the attic above the computer room area. See Table 1 for detailed results.

No measurable air concentrations were detected in the control room, administrative area or outside the Chicago ARTCC.

Two samples collected in the attic area above the control room indicated air concentrations of approximately 11,700 fibers per cubic meter of air sampled. These results are barely above the minimum sensitivity of the sampling and analytical method. All other samples in the attic were below the sensitivity range.

The one personal sample taken on the investigator to estimate the short term (15 minute ceiling exposure) was below the minimum sensitivity level, thereby well below the recommended or currently allowable ceiling exposure; however, this did not indicate what the exposure might be to a worker performing maintenance and repair operations in the attic. See Table II for detailed results.

VII. CONCLUSIONS AND RECOMMENDATIONS

The results indicate there was no airborne or deposited asbestos within the control room on the day of the investigation.

There is no doubt that the material sprayed-on the underside of the roof contains a high percentage of friable asbestos. This material is in a state of major deterioration, with much loose material deposited on all horizontal surfaces within the attic area and both upper surfaces of the two drop-ceilings.

The results of this investigation cannot predict or estimate the amount of asbestos to which maintenance personnel may be exposed during the performance of their duties in the attic area.

Also, should any project be undertaken to replace the damaged panels in the second drop-ceiling, asbestos would certainly be released to the control room environment.

Without the benefit of observing maintenance procedures in the attic area, it is highly recommended that the personal exposure be determined during these operations. Concurrently, it is also recommended that anyone entering and working in the attic be equipped with all the necessary personal protection, including certified respirators, and a complete set of removal/disposal clothing including caps gloves, coveralls and shoe covers. Also, these materials should be disposed of within the confines of the attic upon departure by the employee/s, be placed in acceptable containers, and disposed of in accordance with EPA regulations.

Due to the fact that maintenance must be performed (i.e., changing of air filters and other such routine and/or non-routine activities), asbestos fibers could be introduced within the air distribution system itself. Any renovation work must be performed in a manner acceptable to OSHA to avoid asbestos exposure to both the controllers and the workers during the renovation.

Long-term alternatives to reduce or eliminate asbestos exposure from friable asbestos material are outlined and described in the EPA publication "Asbestos-Containing Materials in School Buildings, A Guidance Document, Part 1 and 2[4]." Consideration should be given to complete removal of the asbestos material from the structure as a means of control. A NIOSH slide/audio program describing worker protection during asbestos removal is available from the NIOSH, EPA, and OSHA regional offices. Worker protection during removal or stripping operation is covered by OSHA regulation 29 CFR 1910.1001, occupational exposure to

asbestos[5], and EPA regulation 40 CFR 61, subpart B: National Emission Standard for Asbestos[6].

VIII. REFERENCES

1. P&CA Method No. 239: NIOSH Manual of Analytic Methods Volume 1 DHEW (NIOSH) Publication No. 77-157A, April, 1977

2. Criteria for a Recommended Standard...Occupational Exposure to Asbestos, 1972, HEW Publication (NIOSH) HSM 72-10267.

3. Revised Recommended Asbestos Standard, 1976 HEW Publication (NIOSH 77-169).

4. Asbestos Containing Materials in School Buildings: A Guidance Document, Part 1 and 2, 1978. EPA Publication No. EPA-450/1,2-78-014.

5. General Industry Standards: Occupational Safety and Health Administration Safety and Health Standards (29 CFR 1910) revised January 1976.

6. National Standards for Hazardous Air Pollutants: Asbestos, (40 CFR 61) Federal Register, Vol. 38, No. 66, 1973.

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ARTCC
Aurora, Illinois

TABLE 1
RESULTS OF BULK SAMPLES ON JUNE 28, 1979
FOR ASBESTOS CONTENT

SAMPLE LOCATION	% ASBESTOS
Control Room Dust off console diagonal-South	NONE
Control Room Dust off console diagonal-Middle	NONE
Control Room Dust off console top-middle	NONE
Attic over control room SW corner-off steel beam	APPROX. 80
Attic over control room OFF "plenum" near air intake	50-60
Attic over control room Off drop-ceiling	APPROX. 50
Attic over control room SE corner-off steel beam	50-60
Attic over Control room Off steel beam near 220 Unit	NONE
Attic over Computer room Off steel beam-near south wall	1-2
ATTIC over Computer room Off steel beam-middle	1-2

TABLE II
RESULTS OF ENVIRONMENTAL SAMPLES
ON JUNE 28, 1979
FOR AIRBORNE ASBESTOS

SAMPLE LOCATION	SAMPLE TYPE	DURATION OF SAMPLE-MINUTES	SAMPLE VOLUME LITERS	ASBESTOS FIBERS/CUBIC METERS OF AIR*
Control Room Desk #1	Area	256	448	less than sensitivity
Control Room Desk #2	Area	255	408	less than sensitivity
Control Room Atop middle console	Area	254	445	less than sensitivity
Outdoors	Area	262	393	less than sensitivity
Office in Administrative area	Area	259	453	less than sensitivity
Attic-290 Return air (inside dust)	Area	243	413	less than sensitivity
Attic-#230 Atop duct	Area	242	424	11,792
Attic-inside "Walk-in" vent duct	Area	244	427	11,710
Attic-On NIOSH Investigator moving about	Personal	016	028	less than sensitivity

NIOSH Evaluation Criteria (not to be exceeded)	500,000
OSHA Evaluation Criteria (not to be exceeded)	2,000,000

Less than sensitivity = less than 4500 fibers per filter.

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BIBLIOGRAPHIC DATA SHEET	1. Report No. NIOSH-HE-TA-79-41	2.	3. Recipient's Accession No.
4. Title and Subtitle Hazard Evaluation and Technical Assistance, Report No. TA 79-41, Chicago Air Route Traffic Control Center, Aurora, Illinois,			5. Report Date 11/00/79 6.
7. Author(s) Kramkowski, R. S., and S. D. McQuilkin			8. Performing Organization Rept. No.
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16. Abstracts

ABSTRACT: Environmental and personal air, dust, and bulk samples of aerosol attic insulation material were analyzed at the request of the Federal Air Surgeon, Department of Aviation Administration, to determine if 700 employees in the Chicago Air Route Traffic Center in Aurora, Illinois were exposed to hazardous airborne asbestos (1332214) concentrations. All samples were collected on membrane filters and analyzed by phase contrast microscopy. Bulk samples were tested by polarizing and dispersion staining techniques. The insulation material contained either 2 percent or 50 to 80 percent asbestos. Air samples of less than 11,792 asbestos fibers per cubic meter were below OSHA criteria of 2 million asbestos fibers per cubic meter. Dust samples did not contain asbestos. The authors conclude that a hazard from asbestos did not exist for empolyees at the time of this study, except in nonroutine functions such as maintenance work in the attic or during renovations. They recommend that anyone entering the attic wear disposable protective equipment, and any renovations be performed in a manner acceptable to OSHA.

KEYWORDS: NIOSH-Publication, NIOSH-Author, NIOSH-Technical-Assistance-Report, TA-79-41, Air-transportation, Traffic-controllers, Air-sampling, Insulation-materials, Asbestos-dusts, Personal-protective-clothing, Air-contaminants, Spray-coating, Hazard-uncconfirmed, Office-workers

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