U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 76-40-341

919 Third Garage Company
229 East 55 Street
New York, New York

November 1976

I. TOXICITY DETERMINATION

On the basis of environmental air samples collected on May 25 and August 8, 1976, evaluations of the ventilation system and work procedures, available toxicity information and confidential employee interviews, it was determined that at the time of these investigations the workers were not exposed to hazardous airborne concentrations of asbestos, nuisance dusts and lead. However, an appreciable increase in the amount of asbestos flaking from the beams and ceilings and falling to the floor, could result in the dispersal of asbestos fibers into the air in quantities tending to injure the worker's health.

A potential health hazard may exist from exposure to carbon monoxide since the garage workers' estimated time weighted average exposure was 35 ppm. Although this concentration does not exceed the current OSHA standard, it is at the level that NIOSH recommends for occupational exposure. Furthermore, on the day that the carbon monoxide measurements were made, the number of cars entering and leaving the garage was about 30% below the normal daily average. During periods of greater activity, the levels of carbon monoxide would be expected to rise. The complaints of headaches by 3 of the 8 workers interviewed tends to support this conclusion.

Recommendations to improve the conditions considered to represent potential health hazards are provided at the end of the report.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this determination report are available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. Copies have been sent to:

a) 919 Third Garage Company
b) Authorized Representative of Employees
c) U.S. Department of Labor, Region II
d) NIOSH, Region II

For the purpose of informing the 10 affected employees, the employer will promptly post the Determination Report in a permanent place(s) readily accessible to workers for a period of 30 calendar days.

III. INTRODUCTION

Section 20(a) (6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 699 (a) (6), authorizes the Secretary of Health, Education, and Welfare, following a written request by an 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 more than three employees of the 919 Third Garage Co. regarding worker exposure to asbestos, tire dust and carbon monoxide. The employees are represented by Local 272 of the Teamsters' Union.

IV. HEALTH HAZARD EVALUATION

A. Description of Operations

A two level underground parking garage having a capacity of about 340 cars is operated on these premises. The cellar level is about 20 ft. below ground, and the subcellar is approximately 15 ft. below the cellar. Cars enter from the street by a 25 ft. wide curving down ramp. They stop at the check-in station, are ticketed and then are driven to a parking spot on either level by one of the garage attendants. Two cashier's booths are also located on the cellar level. The smaller of these booths is situated directly opposite the lower end of the entrance ramp. This booth and a bench positioned against the wall behind the booth are generally occupied by the attendants when they are not parking or retrieving cars. About 40 to 50% of their working time is spent in these areas.

The garage is open 7 days a week, 18 hours per day. Seven of the ten people employed here work between the hours of 7 AM and 6 PM. About 400 cars are handled per day. The busiest hours are generally 8 AM to 10:30 AM and 3:30 PM to 6 PM.

There is a general mechanical ventilation system consisting of several overhead and wall exhaust grilles on each garage level. Ducts lead from these grilles to either a floor or wall opening in the fan roon which serves as a plenum and contains a 5 ft. square open inlet backward curved fan, belt driven by a 20hp motor. The fan discharges to the out doors. At the cellar level, make-up air is obtained through the ramp and through openings in the false ceiling. On the subcellar level, make-up air enters only through the ramp.

When the building was originally constructed about eight years ago, the exposed beams and adjacent ceiling surfaces on both parking levels were sprayed with an asbestos containing insulating material. This material is now flaking off and falling to the floor where it is subject to crushing and dispersal into the air by movement of automobiles.

Accumulations of black dust were noted on the floors near the walls on both levels. This material which is probably a combination of road dust and rubber abraded from tires is considered to be a nuisance dust. It is removed once a week by means of a mechanical sweeper.

B. Evaluation Design

On May 25, 1976, environmental samples for asbestos were taken in the breathing zones of four of the garage attendants by the use of battery powered personal sampling pumps worn by these workers. Similar pumps were also used to collect samples for lead and total airborne particulates in the general air of the cellar and subcellar and in both cashiers' booths. The asbestos and lead samples were collected on AA filters, while VM filters were used to obtain the samples for the weight determination of total particulates. The airborne asbestos concentrations and the asbestos content of a sample of loose insulation were determined by optical microscopic examination. Atomic absorption was used to analyze the filters for lead.

On August 8, 1976, carbon monoxide concentrations were measured in the workers' breathing zones and in the general air throughout the garage by means of Draeger gas detector tubes.

The Alnor velometer was used to make air flow measurements of the exhaust system, and medical questionnaires were administered to 8 of the 10 employees.

C. Evaluation Criteria

Asbestos

Asbestos exposure has been associated with the production of lung fibrosis called asbestosis as well as with cancers of the lung, pleura and peritoneum. In its advanced stages asbestos may be evident by characteristic manifestations on x-ray films, by reductions in pulmonary function or by certain clinical signs such as finger clubbing or dry cracking sounds within the lungs. The most important symptom is shortness of breath. The disease is progressive, even after exposure ceases. It usually takes more than 20 years after exposure begins before any clinical evidence of asbestosis or asbestos cancers appear. Variations in the time of occurrence among individual cases may, however, occur, making it impossible to predict the latency period for the risk of any particular worker. The current Federal occupational health standard as promulgated by the Occupational Safety and Health Administration for an 8 hour time weighted average

exposure is 2 fibers per cc of air based on a count of fibers longer than 5 micrometers. A permissible ceiling concentration of 10 fibers per cc also is in effect. These levels also represent the permissible concentrations recommended by NIOSH in its 1972 criteria for a recommended standard for occupational exposure to asbestos. The 1975 Threshold Limit Value adopted by the American Conference of Governmental Industrial Hygienists (ACGIH) for an 8 hour time weighted average exposure is 5 fibers per cc. It also should be noted that the Occupational Safety and Health Administration on September 30, 1975 issued a proposed standard for asbestos which, among other things, would lower the permissible 8 hour time weighted average occupational exposure to 0.5 fibers per cc and reduce the permissible ceiling exposure to 5 fibers per cc for any period not exceeding 15 minutes.

Lead

Inhalation of lead fume may result in lead poisoning. Signs and symptoms may include abdominal pain with tenderness, constipation, headache, weakness, muscular aches and cramps, loss of appetite, nausea, vomiting, weight loss, anemia with pallor and lead lines. At the present time, the U.S.D.O.L. Occupational Safety and Health Administration (OSHA) standard for an 8 hour time weighted average exposure to lead is 0.2 mg/cu.m. of air. However, in October 1975, OSHA issued a proposal to reduce this value to 0.1 mg/cu.m. The 1975 threshold limit value specified by ACGIH and the permissible concentration recommended by NIOSH in its 1972 criteria document are 0.15 mg/cu.m. for an 8 hour time weighted average exposure.

Nuisance Dust

Inhalation of excessive amounts cause no adverse effects in the lung. Elevated concentrations reduce visibility and may result in unpleasant deposits in the eyes and nose plus injury to the mucous membranes through mechanical action. The OSHA standard for an 8 hour time weighted average exposure to nuisance dusts is 15 mg/cu.m. while the current ACGIH threshold limit value is 10 mg/cu.m. for total particulate.

Carbon Monoxide

The signs and symptoms of acute carbon monoxide poisoning may include headache, nausea, vomiting, dizziness, drowsiness and collapse. Carbon monoxide exerts its harmful effect by reducing the oxygen-carrying capacity of the blood through the formation of carboxyhemoglobin. The intensity of the symptoms is related to the carboxyhemoglobin levels achieved. Deleterious alterations to the heart muscle may be initiated or enhanced in individuals with coronary heart disease who are exposed to carbon monoxide concentrations sufficient to produce a carboxyhemoglobin level greater than 5%. The role of cigarette smoking also must be considered since cigarette smoking causes increased exposure to carbon monoxide and there is an undeniable relationship between chronic cigarette smoking and increased risk of coronary heart disease. Important evidence also exists which indicates that subtle aberrations may occur in the central nervous system during exposure to low levels of carbon monoxide. Upon

weighing all these factors, NIOSH in its 1972 criteria document recommended an 8 hour time weighted average exposure of 35 ppm and a ceiling limit of 200 ppm. The recommended time weighted average standard of 35 ppm is based on the concentration of carbon monoxide sufficient to produce a carboxyhemoglobin level not exceeding 5%. The ceiling concentration of 200 ppm represents an excursion above the 35 ppm level which is not expected to significantly alter the employees' carboxyhemoglobin level.

This recommended standard does not consider the smoking habits of workers since the level of carboxyhemoglobin in chronic cigarette smokers has generally been found to be in the 4 to 5 percent range before exposure to carbon monoxide.

The current permissible OSHA limit for an 8 hour time weighted average exposure to carbon monoxide is 50 ppm. This value also is recommended by the ACGIH as its 1975 threshold limit value.

D. Evaluation Results and Discussion

The concentrations of asbestos, lead and nuisance dust found in the workroom air were well below the existing and any proposed standards. The bulk sample of insulation taken from an exposed beam revealed an asbestos content of 10 to 15% (Table I and II).

In view of the highly toxic nature of asbestos, it is our opinion that existing conditions represent a potential hazard to the workers' health despite the low concentrations which were measured. More extensive flaking of asbestos will undoubtedly occur in the future, resulting in larger quantities falling to the floor and being dispersed into the workroom air. Preventive measures therefore appear to be indicated.

No further action is deemed necessary with respect to the lead and nuisance dust exposures.

Detector tube (Draeger) measurements for carbon monoxide were made during the day in the workers' breathing zones and throughout both garage levels. The levels found ranged from 5 to 90 ppm. On the basis of these results and a time study of garage activities, it was estimated that the garage workers' time weighted average exposure to carbon monoxide was 35 ppm. The highest concentrations were found between 9 and 11 AM at the check-in area. It is during these hours that the largest number of cars enter the garage and reach the check-in area simultaneously with their engines running (Table III).

Velocity measurements at the exhaust grilles and fan room air intake openings indicated a total exhaust air volume of approximately 45,000 cfm. The positions of the make-up air inlets and exhaust grilles are such that the air does not uniformly sweep across the entire garage area. Also the exhaust grilles were covered with a fairly heavy layer of dust and dirt.

The results of the employee medical interviews revealed that 3 of the 8 employees interviewed complained of headaches. Only one of these three workers is a cigarette smoker.

The worker's exposure to carbon monoxide represents a borderline situation. Although below the current OSHA exposure limit, the concentrations found are at the level recommended by NIOSH for an 8 hour time weighted average exposure. It should be noted that on the day of the carbon monoxide measurements garage traffic was about 30% less than normal. Higher average levels of this gas could therefore be expected in the garage during days of greater activity. The complaints of headaches made by some employees tends to indicate the existence of such conditions. The capacity of the exhaust system is not considered to be entirely adequate for maintaining the carbon monoxide concentrations at satisfactory levels at all times. The ventilation rate recommended by the ACGIH to control carbon monoxide concentrations to an average level of 50 ppm is about 500 cfm for each car that the garage can hold. On this basis a total exhaust volume of about 170,000 cfm would be required. However, the existing garage exhaust system was apparently designed on the basis of 1 cfm per sq. ft. of floor area (about 50,000 cfm - N.Y. City requirement). Furthermore, there was little air flow at the check-in area, the location of maximum carbon monoxide concentrations. The dirt accumulations on the exhaust grilles also tended to reduce the operating capacity of the system.

V. Recommendations

1. Consideration should be given to properly sealing or removing the insulation material from the ceilings and beams to prevent a potential hazard to the health of the workers from exposure to asbestos.

2. In order to prevent the concentrations of carbon monoxide from exceeding permissible levels, efforts should be made to increase the capacity of the exhaust system. Some improvement may be obtained by increasing the fan speed and motor horsepower and by cleaning the grilles and ducts (if necessary) and maintaining them in a clean condition. However, to insure satisfactory results under all conditions of garage activity, it is likely that an additional ventilation system, operated particularly during the busy morning hours, will be required for the cellar level check-in area.

VI. References

1. Criteria for a Recommended Standard, Occupational Exposure to Asbestos 1972, NIOSH.

2. Occupational Exposure to Asbestos, Notice of Proposed Rulemaking, U.S. Dept. of Labor, OSHA, Federal Register, Oct. 9, 1975.

3. Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1975, ACGIH.

4. U.S. Department of Labor, Occupational Safety and Health Standards, Federal Register Title 29, Part 1910.1000.

5. Lead, Occupational Exposure; Proposed Standard, U.S. Dept. of Labor, OSHA, Oct. 3, 1975.

6. Criteria for a Recommended Standard, Occupational Exposure to Inorganic Lead, 1972, NIOSH.

7. Criteria for a Recommended Standard, Occupational Exposure to Carbon Monoxide, 1972, NIOSH.

VII. Authorship and Acknowledgements

Report Prepared by:

Irving Kingsley
Industrial Hygienist
Region II
New York, N.Y.

Originating Office

Jerome P. Flesch,
Acting Chief
Hazard Evaluation and
Technical Assistance Branch

Table I

Airborne Concentrations of Asbestos

919 Third Garage Company
New York, New York

May 25, 1976

Description	Time	Concentration Fibers/cc
Personal Sample on attendant #1	8:01-9:45	<0.01
	9:46-12:21	<0.01
	13:34-16:50	<0.01
Personal Sample on attendant #2	8:05-9:48	<0.01
	9:51-10:55	<0.01
	12:24-15:22	<0.01
Personal Sample on attendant #3	8:14-9:54	0.03
	9:55-11:57	<0.01
	12:57-15:25	<0.01
Personal Sample on attendant #4	9:02-9:56	<0.01
	9:58-12:52	<0.01
	14:12-17:48	0.06
General Air - Office	8:25-10:00	<0.01
	10:02-17:13	<0.01

Bulk Sample - 10-15% asbestos

Table II

Airborne Concentrations of Nuisance Dust and Lead

919 Third Garage Company
New York, New York

May 25, 1976

Description	Time	Concentration - mg/cu.m. Nuisance Dust	Lead
General Air - Cellar	8:20-12:28	.05	--
Check-in Station	8:23-12:26	--	.011
General Air - Cellar	12:32-17:38	.09	--
Cashier Booth	12:31-17:38	--	.002
General Air - Subcellar	8:10-17:07	.09	--
	8:09-17:07	--	016
General Air - Office	8:27-17:13	.13	--

Table III

Airborne Concentrations of Carbon Monoxide
919 Third Garage Company
New York, New York

August 5, 1976

Time Period	Worker Exposure - Average Concentration-ppm
7:00 - 8:00	10
8:00 - 9:00	40
9:00 - 10:00	90
10:00 - 11:00	70
11:00 - 11:30	20
11:30 - 14:00	10
14:00 - 15:00	20
15:00 - 16:00	20
16:00 - 17:00	30
17:00 - 18:00	30