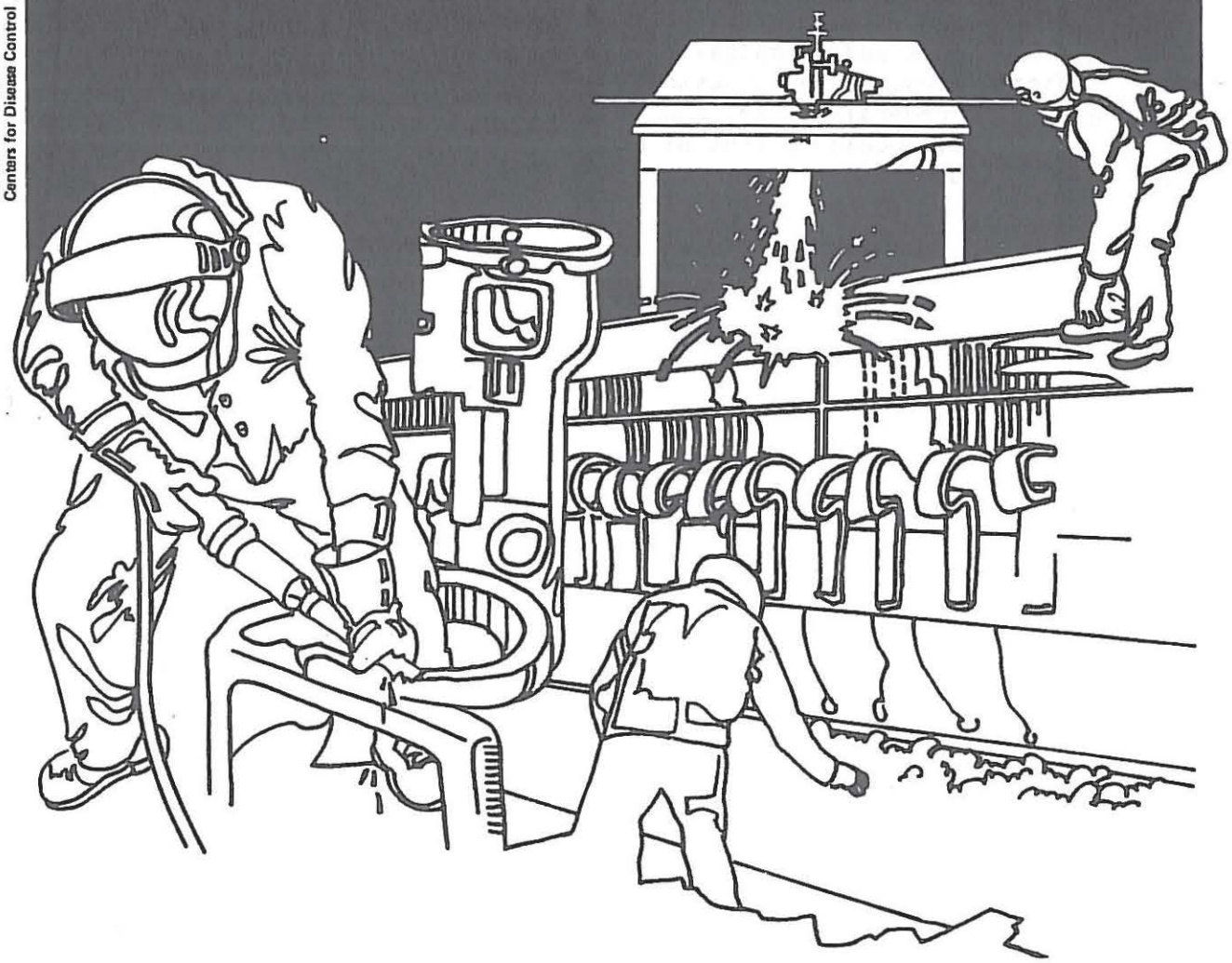
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public H Service
Centers for Disease Control ■ National Institute for Occupational Safet, Health

NIOSH



Health Hazard Evaluation Report

HETA 81-447-1273
LANE COMMUNITY COLLEGE
EUGENE, OREGON

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any 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 Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

HETA 81-447-1273
MARCH 1983
LANE COMMUNITY COLLEGE
EUGENE, OREGON

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I. SUMMARY

In September 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request from the Administration of Lane Community College, Eugene, Oregon, to evaluate the possible occupational etiology of symptoms involving the peripheral nervous system in employees of the home economics department.

On January 11-13, 1982, NIOSH investigators evaluated the general ventilation system of the home economics building and conducted a survey using a self-administered questionnaire. Employees who reported symptoms were interviewed by a NIOSH physician and a brief neurological evaluation was performed. On May 13 and on November 3 and 4, 1982, environmental air samples were collected. Additional medical interviews were conducted between October 19 and November 4, 1982, with 68 of 70 full-time employees who worked for Departments located in the building, and 24 additional workers who had spent some time in the building.

Air samples collected in the laundry dryer exhaust while shop rags were dried showed 2.5 ppm of organic chemicals which resembled stoddard solvent. Air samples were collected in various locations in the health occupation building for polar and nonpolar organic solvents, chlorine, fluorides, and various metals; these substances were not detectable. Air samples were collected for: acrylamide, arsenic, calcium arsenate, carbon disulfide, carbon monoxide, chlorine, fluoride, n-hexane, lead, lead arsenate, mercury methyl bromide, methyl butyl ketone, methylene chloride, thallium-soluble compounds, triorthocresyl phophate, all of which are known to cause peripheral neuropathy. None of these substances were detectable by the sampling and analytical methods used. Carbon monoxide concentrations were all 2 ppm or less.

Forty-four of 92 (48%) workers interviewed reported symptoms consistent with peripheral neuropathy. Twenty nine of the 44 symptomatic workers sought medical attention for their neurologic symptoms and for 17 of these nerve conduction velocity tests were performed. Neither results of nerve conduction velocity tests nor the pattern of the reported symptoms suggested the occurrence of peripheral neuropathy due to chemical exposure. However, six employees had nerve conduction velocity tests suggestive of carpal tunnel syndrome.

Based on the results of the environmental air sampling and medical investigation, NIOSH concludes that: 1) no detectable concentration of substances potentially capable of producing peripheral neuropathy existed in the environment on the days and under the conditions the sampling was conducted; and 2) neither the pattern of reported symptoms nor the results of the nerve conduction velocity tests suggested that a neurotoxic substance had been responsible for the symptoms. Recommendations to improve the building ventilation system and work practices are included in Section IX of this report.

KEYWORDS: SIC 8222 (Junior Colleges, Community Colleges), carpal tunnel syndrome, dental chemicals, laundry products, peripheral neuropathy, ventilation

II. INTRODUCTION

In September 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request from the administration of Lane Community College to determine if symptoms involving the peripheral nervous system, being experienced by employees in the health technology building, were caused by exposures at work. The following surveys were conducted: an initial survey on October 14, 1981, and follow-up environmental surveys and/or medical surveys on January 11-13, May 13 and October 19 - November 4, 1982. Interim reports were provided to the College on February 9, September 29, November 12 and December 14, 1982.

III. BACKGROUND

Eight employees of the home economics department, who work on the lower floor of the Health Technology Building, reported experiencing peripheral nervous system symptoms. One person first experienced symptoms in July 1976. The others reported onset of symptoms during the time period of 1976 to February 1981. The symptoms included numbness and/or prickly feeling in one or more hands, arms, legs and feet. It was reported that nerve conduction tests on several individuals found nerve conduction velocities below the normal range. Since the persons all worked in the same area, they were concerned that the symptoms might have been caused by exposure to substances in the work environment.

Floor plans of the Health Technology Building are shown in Appendix A. The Home Economics Department is located on the ground floor of a two-story building. Each floor of the building is basicly two buildings with a covered breezeway between them. Located in the building are the child development center, the home economics office, health occupation office, dental labs, nursing labs, classrooms, a laundry and, in the basement, the heating and air conditioning mechanical room. The adjacent gymnasium building is located 40 feet from the laundry, and the area between is also covered by the breezeway.

The heating and air conditioning system is a forced air system. The heat is supplied by hot water from a central campus heating plant. The air is distributed to all rooms by ductwork. The return air from each room is mixed with the return air from the entire building in the mechanical room. Depending on the outside temperature, up to 90% of this air is recirculated. The additional make-up air is provided by an air intake at the bottom of a set of stairs which are next to the laundry and a paved loading area for trucks. With this system an airborne contaminant generated in a room and not controlled by local exhaust ventilation would eventually be diluted and distributed through the entire building. In this manner, all other rooms would receive a portion of the contaminant via the central ventilation system. Also any contaminant entering the make up air, e.g., gas or diesel engine exhaust or odors from the laundry, would be distributed throughout the building.

The air pressures in room numbers 107, 108, 109, 110, 111, 112, 113, 114, and 115 were negative relative to the outside air, i.e., the pressure in each room was less than the outside air pressure. These rooms were occupied by the home economics department except Room 108 which was the dental lab. All other rooms were positive. Under negative pressure conditions any airborne contaminant present in the breezeway would be sucked into the rooms through open doors or cracks around the doors.

Potential airborne contaminants were generated in the laundry, dental lab, and dental clinic. Prior to November, 1978, the laundry dryer exhaust terminated in the open at the end of the building. When the area between the health building and the gymnasium was covered, this exhaust was vented into the breezeway. In the summer of 1981 (following an initial NIOSH visit), the exhaust vent was modified by installing ductwork to exhaust on the roof of the breezeway. The laundry washes and dries the clothing and towels used in physical education. One day a week, automotive shop rags and dust mops were washed and dried for several hours. The home economics staff reported that on these days there would be a "bluish haze" in the breezeway and that the haze would enter their rooms. At times they would also notice the odor of chlorine. Since the home economics rooms were under negative pressure and the laundry exhaust terminated in the breezeway, airborne substances from the laundry exhaust could have entered the home economics rooms. The ventilation system make-up air intake was located close to the laundry exhaust vent. Before the dryer exhaust was moved to the roof, the laundry exhaust could have entered the make-up air intake and been distributed throughout the building.

Various chemicals are used in the dental lab (room 108). There are no hoods or other local exhaust ventilation systems present in this lab. When chemicals are used, they are exhausted through the general ventilation system and, as stated previously, may then be distributed throughout the entire building. There is an autoclave in the dental lab (room 272B). There is a small exhaust fan in the ceiling about five feet above the autoclave which smoke tube tests indicated is not effective in removing contaminants as they left the autoclave.

Possible air contaminants that could have been present in the breezeway and rooms were products from the dryer exhaust (soaps, bleaches, oils from rags and mops); dental lab (chemicals including methyl methacrylate, and emissions from the autoclave); kitchen (food odors and sprays used for sanitation control); and the child development center (chemicals to sterilize toys and furniture). The furnishings, floors and floor covering, and ceiling material in the home economics rooms were similar to those items in the other rooms of the building.

IV. EVALUATION DESIGN AND PROGRESS

A. Environmental

Environmental surveys were conducted on January 11-13, May 11 and November 3-4, 1982. These surveys consisted of a thorough check of the ventilation system to determine which rooms were positive or

negative relative to the outside air; the collection of environmental samples to determine possible contaminants being exhausted through the laundry dryer exhaust; and the collection of environmental samples in the building to determine the presence of substances known to cause peripheral neuropathy. Environmental sampling done by the Oregon State Accident Insurance Fund during 1981 and 1982 were reviewed.

B. Medical

The first portion of the medical survey was conducted on January 11-13, 1982 and involved distribution and collection of confidential self-administered questionnaires concerning health history, symptoms and occupational history. Employees who reported symptoms consistent with peripheral neuropathy were subsequently interviewed by the NIOSH medical officer and a brief neurological evaluation was performed. Releases of medical information were obtained for those workers who had seen private physicians.

The questionnaire was returned by all of the 23 employees in Home Economics Department, 19 out of 20 in Health and Physical Education, 27 out of 36 in Health Occupations, and 12 out of 34 in the Language Arts Department. The Language Arts Department was not housed in the Health Technology Building and respondents from that Department served as a control group.

The second portion of the medical survey was conducted October 14 - November 4, 1982.

In order to evaluate the symptoms reported by Health Building workers, NIOSH physicians conducted personal interviews with 68 of 70 full-time workers in the Departments housed in the building, i.e., Home Economics, Health Occupations, and the Laundry. The physicians also interviewed 24 other workers who had requested interviews. These workers had worked either full or part-time in the Health Building at some time in the recent past, but now were either retired or working in other departments elsewhere on the LCC campus. Permission was requested to obtain medical records of workers who had sought medical attention for neurologic symptoms.

V. EVALUATION METHODS

A. Environmental

General area samples were collected for airborne metals, gases and vapors in rooms 107, 108, 110, 245, 271B, 272, and the mechanical room, the laundry and the laundry dryer exhaust. The following is a list of the substances sampled that were either: 1) known to cause peripheral neuropathy; 2) of concern to the workers; 3) chemicals and/or by-products of chemicals used in the laundry or other items being washed and dried; or 4) chemicals used or generated in other rooms of the building (i.e., the dental lab and home economics rooms).

Substance	Collection Method	Flow Rate	Analytical Method[1]
acrylamide	glass fiber filter & silica gel tube	1 lpm	OSHA Method 5-21
arsenic	cellulose membrane filter	1.5 lpm	P&CAM S-309
calcium arsenate	cellulose membrane filter		P&CAM S-309
carbon disulfide	charcoal tubes	200 cc/min	P&CAM S-248
carbon monoxide	long term detector tubes	20 cc/min	--
chlorine	long term detector tubes	20 cc/min	--
fluoride	filter with treated back up pad	1.5	P&CAM 212
n-hexane	charcoal tubes	200 cc/min	P&CAM 127
lead	cellulose membrane filter	1.5 lpm	P&CAM 173
lead arsenate	cellulose membrane filter	1.5 lpm	P&CAM S-309
mercury	iodine treated charcoal	200 cc/min	atomic absorption techniques
methyl bromide	charcoal tube	200 cc/min	P&CAM 127
methyl butyl ketone	charcoal tube	200 cc/min	P&CAM 127
methylene chloride	charcoal tube	200 cc/min	P&CAM 127
thallium, soluble compounds	cellulose membrane filter	1.5 lpm	P&CAM 173
triorthocresyl phosphate	cellulose membrane filter	1.5 lpm	P&CAM S-209
*other metals not listed above	PVC filter	1.5 lpm	ICP-AES

Substance	Collection Method	Flow Rate	Analytical Method[1]
other organic compounds not listed above:			
polar compounds	charcoal tubes	50-200 cc/min	carbon disulfide desorption; gas chromotography; mass spectrometry
nonpolar compounds	Tenax® tubes	50-200cc/min	methanol desorption, gas chromothegraphy, mass spectrometry

*beryllium, cadmium, cobalt, chrome, copper, iron lithium, manganese, molybdenum, nickel, phosphorus, platinum, selenium, silver, tellurium, tin, titanium, vanudium, yttrium, zirconium, zinc.

B. Medical

In order to evaluate the reported symptoms, we first questioned workers and then reviewed the medical records of those who had sought medical attention for their neurologic symptoms. We attempted to characterize the symptoms reported by each worker in the following ways: time of onset, frequency of occurrence, duration, and anatomic distribution. From the medical records we searched for objective evidence which would represent a pathophysiologic process involving peripheral nerves [e.g., nerve conduction velocity tests (NCVT)].

VI. EVALUATION CRITERIA

A. Environmental

The environmental criteria for exposure to toxic substances used in this evaluation are based on the following: 1) NIOSH Criteria Documents Recommended Standards for Occupational Exposure; 2) Threshold Limit Values (TLV's) of the American Conference of Governmental Industrial Health Standards. Unless stated otherwise, the Oregon State Standards are time weighted average (TWA) for an 8-hour day and the NIOSH recommended criteria are TWA for 10 hour workday. These values represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effects.

Substance	Oregon State Standard	NIOSH or (ACGIH) Recommended Criteria
acrylamide	0.3 mg/cu m	0.3 mg/cu m
arsenic	10 ug/cu m	2 ug/cu m
calcium arsenate	10 ug/cu m	2 ug/cu m
carbon disulfide	20 ppm	1 ppm
carbon monoxide	50 ppm	35 ppm
chlorine	1 ppm ceiling	0.5 ppm 15 min ceiling
fluoride	2.5 mg/cu m	2.5 mg/cu m
n-hexane	500 ppm	100 ppm
lead	50 ug/cu m	50 ug/cu m
lead arsenate	10 ug/cu m	20 ug/cu m 15 min ceiling
mercury	0.05 mg/cu m	0.05/cu m
methyl bromide	15 ppm	15 ppm (ACGIH)
methyl butyl ketone	100 ppm	25 ppm (ACGIH)
methylene chloride	500 ppm	100 ppm (ACGIH)
thallium, soluble compounds	0.1 mg/cu m	0.1 mg/cu m (ACGIH)
triorthocresyl phosphate	0.1 mg/cu m	0.1 mg/cu m (ACGIH)

B. Medical

Employees were asked about symptoms, e.g., pain, numbness, tingling, or weakness involving the extremities, the occurrence of which is not uncommon among healthy people. Therefore, the reported symptoms of the LCC workers were evaluated by comparison with symptoms found in instances where a common toxic exposure had been responsible for a cluster of cases of peripheral neuropathy. The following features have been observed in these clusters:

1. The symptoms of peripheral neuropathy are usually insidious in onset and persist for long periods. Transient "tingling" is not usually a feature of toxic peripheral neuropathy.

2. Motor and sensory symptoms (weakness and tingling) are usually present together and seen in a similar pattern and distribution in the people with cases.

3. Both sides of the body are usually affected and the lower extremities which have longer and more vulnerable nerve fibers are usually affected before the arms.

4. Symptoms usually become progressively worse if there is persistent exposure and improve slowly when the exposure ceases.

5. The course of the illness may be protracted for many weeks.

6. In persons with severe subjective symptoms, neurotoxic effects can usually be documented using specific objective measurements, e.g., abnormal nerve conduction tests, loss of reflexes on physical examination, or pathology found on nerve biopsy.

   In the evaluation of the objective measurements done for LCC workers who reported symptoms and sought medical attention, the results of NCVT were reviewed. The tests were performed and interpreted in a variety of settings over an extended time period by private practice physicians. While we were not able to standardize the conditions in which the tests were conducted, we were able to search the results for objective evidence of a pathophysiologic process which would account for the reported symptoms. The method and interpretation of NCVT are discussed in references 2 and 3.

C. Health Effects

The health effect of concern in this investigation was peripheral neuropathy. The substances known to cause this are acrylamide, arsenic, calcium arsenate, carbon disulfide, n-hexane, lead, lead arsenate, mercury, methyl bromide, methyl butyl ketone, thalium, trinitro toluene, and triorthocresyl phosphate.

(Since these substances were not present in significant concentrations, the specific health effects of each substance will not be listed in this report.)

VII. RESULTS AND DISCUSSION

A. Building Ventilation

The ventilation system was evaluated during each visit to determine if the air pressure in the rooms was greater or less than the outdoor pressure. In January and May 1982 rooms 107 through 115 were negative relative to outside air. These rooms are occupied by the home economics department except 108 which is the dental lab. The air pressure in all other rooms was positive. Under negative pressure conditions, any airborne contaminant present in the

breezeway would have been sucked into the rooms through doors or cracks around the doors. Prior to October 1982, the ventilation system was rebalanced. In October all the rooms had positive pressure except room 109, 110 and 111. During the NIOSH visit on October 20, the system was again adjusted and the air pressure in all the rooms was then positive relative to the outside air.

Based on the current setup of the heating and air conditioning system, any chemical used in one room will be diluted and redistributed to all rooms in the building. The laundry dryer exhaust now terminates above the roof and should not present a problem of the exhaust entering the breezeway or the ventilation system. In the past, however, it would have drifted into the breezeway, and the make up air intake.

On October 19 and 22, while the NIOSH physicians were present on the LCC campus, there were two incidents of chemical smells in the room atmosphere. Immediate investigation revealed that on one occasion a motor vehicle with the motor running was parked near the air intake of the building, and on the second occasion, a small gasoline powered jitney was being operated in the lower level breezeway.

B. Environmental Results

It was not possible to duplicate all past conditions. Samples for airborne contaminants were collected on May 19, 1982, in three locations: 1) in the dryer exhaust when oily rags were being dried; 2) in room 110; and 3) in the mechanical room. The samples collected in the dryer exhaust were the only ones that contained any detectable organic vapor compounds. Major compounds identified by gas chromatograph/mass spectrometry were C_9 - C_{12} alkanes. Also found were numerous branched chain C_9 - C_{12} alkanes and cycloalkanes, trimethylpentane, some aromatics such as trimethyl- and methylethyl benzenes, and a trace of toluene. Since the pattern of peaks on the two samples closely matched the peak elution pattern of stoddard solvent, a petroleum distillate, the charcoal tubes were quantitated using stoddard solvent as a standard. Stoddard solvent would be expected to be present in automotive shop rags. In the laundry exhaust the stoddard solvent concentration was 2.5 ppm. The exhaust was the area of highest concentration. If a substance were exhausted into the breezeway, it would be diluted before entering the office area and therefore the concentration of that substance in the rooms would be less. The American Conference of Industrial Hygienists recommends an 8-hour time weighted average Threshhold Limit Value of 100 ppm for stoddard solvent. The Tenax® tubes were desorbed in methanol to recover any polar compounds present. Only the sample in the dryer exhaust contained any detectable compounds and the peak pattern was identical to that of the charcoal tubes.

There were no organic vapors found in the mechanical room or in room 110.

The filter samples were analyzed for trace metals. The following elements were all less than 1.0 ug (0.001 mg) per filter: arsenic, beryllium, cadmium, cobalt, chrome, copper, iron, lithium, manganese, molybdenum, phosphorus, platinum, selenium, silver, tellurium, thalium, tin, vanadium, yttrium, zirconium, and zinc. The sample in the dryer exhaust contained 0.017 mg/cu m of sodium which could have been from the detergents used. The sample in room 110 contained 0.004 mg/cu m of calcium, and 0.003 mg/cu m of titanium and nickel. The titanium could have been from the titanium present in smoke tubes that were used to determine the airflow pattern in that room. The titanium and nickel were just at the limit of detection. The sample in the mechanical room contained the following: aluminum 0.005 mg/cu m, calcium 0.072 mg/cu m, magnesium 0.005 mg/cu m, and titanium 0.004 mg/cu m. Near where the sample was collected there was an open barrel of chemicals used in water treatment for the boiler that heats the laundry dryers. This was the probable source of these metals. These concentrations were low and would not present a health hazard to workers who had to enter this area. The calcium found in the air in room 110 could have come from this source since return air passed through the mechanical room before it was redistributed. The allowable concentration for calcium and titanium in the air is 15 mg/cu m which is over 3,500 times the amount found in room 110. The NIOSH recommended criterion for nickel is 0.015 cu m which is 5 times the amount found in room 110.

Environmental air samples were collected November 3 and 4, 1982, in rooms 107, 110, 245, 272 and the laundry. The samples were collected for 8 hours in each location. Samples were collected for substances known to cause peripheral neuropathy even though not all of these substances were being used in the building. They were acrylamide, arsenic and compounds containing arsenic, calcium arsenate, carbon disulfide, n-hexane, lead and inorganic lead compounds, lead arsenate, mercury, methyl bromide, methyl butyl ketone, thallium and tri-o-cresyl phosphate. In addition, due to concern of a past elevated carboxyhemoglobin level in the blood of one worker, samples were collected for carbon monoxide and methylene chloride. Several products containing chlorine and fluoride were used in the laundry and child development center and were of concern to several workers in the building. Therefore, we sampled for chlorine and fluoride. Samples for airborne mercury were also collected in rooms 108 and 271B since there had been some mercury spilled in these rooms in the past. All these substances were not detectable by the sampling and analytical methods used. Only carbon monoxide was measurable, and concentrations were all 2 ppm or less. The concentration of all substances sampled were less than 10% of the criteria used.

During the November sampling period, the laundry was in operation (although no oily rags were washed) and the central heating and air conditioner was set to recirculate 80% of the air and bring in 20% fresh air from the outside. The Dental Lab in room 108 was not in use.

C. Medical Results

The medical findings obtained from the January 11-13, 1982, preliminary medical survey were:

1. The eight persons who initially reported symptoms consistent with peripheral neuropathy were describing mild to moderate symptoms of peripheral neuropathy, i.e., a disruption of the normal function of the peripheral nerves providing sensation to the extremities. The symptoms included numbness, tingling or pain which occurred on an episodic or continuous basis. No grossly abnormal findings were observed in physical examination of the employees reporting such symptoms, as is frequently the case in early or mild peripheral neuropathy.

   Also, we found four additional employees from Health and Physical Education and several employees from Health Occupations who reported symptoms consistent with peripheral neuropathy. Several of the employees reporting such symptoms were not available for interview or physical examination.

2. No employees in the small control group in the Language Arts Department, or among Home Economics Department employees who spend most of their time away from the Departmental offices reported symptoms consistent with peripheral neuropathy.

In October 1982, NIOSH physicians interviewed 92 persons (75 females) who currently work or had worked in the Health Occupations Building. They ranged in age from 21 to 67 years (median age, 36 years), and had worked at LCC from less than one year to fourteen years (median, six years). Among other questions, employees were asked if they had ever experienced any of the following symptoms in their upper or lower limbs since working in the Health Building: pain, numbness, tingling, weakness, or fingers turning white after exposure to cold. Forty-four (48%) reported that they had experienced at least two of these symptoms since they began working in the Health Building. These 44 persons (39 females, 5 males) ranged in age from 30 to 67 years (median, 38.5 years).

The above findings are difficult to interpret. The employees were asked if they had ever experienced, over an extended period, symptoms which are not uncommon in healthy people. The information obtained is therefore difficult to evaluate and cannot be the sole basis for diagnosis. Also the publicity surrounding the issue had caused some employees to become concerned about minor symptoms that they had previously dismissed as of no consequence. The reporting of symptoms may also have been influenced by an informal questionnaire which reminded workers of problems to be reported and was distributed by an employee to workers in September 1982.

One purpose of the questions was to determine if there was any relationship between the reported time of onset of symptoms and the times that people reported the presence of fumes or odors. However, the imprecision of the available data made this approach

unhelpful. Many people were not able to specify the exact time of onset of their symptoms, e.g., the month or day of onset. Forty-two of the 44 people reported a year of onset and 67% (28/42) of these reported onset before 1981. (One person reported onset of symptoms in 1973, 3 in 1975, 2 in 1976, 5 in 1977, 4 in 1978, 8 in 1979, 5 in 1980, 4 in 1981, and 10 in 1982.) It was impossible to document retrospectively the nature of the fumes or odors, or the intensity, duration, or frequency of exposure for the symptomatic people.

Twenty-two (50%) of the 44 had experienced the symptoms intermittently; in four others the symptoms had decreased in severity prior to 1982, and ten persons were symptom free by the time of our interviews. Twelve (27%) had unilateral symptoms, and 24 (54%) had involvement of the upper extremities only.

Of the 29 workers who sought medical attention for their symptoms, 17 had nerve conduction velocity tests (NCVT). For 11 workers the tests were interpreted by the testing physician to be within normal limits. For the remaining six workers the tests indicated abnormal function of the median nerve from the point where it passes from the wrist towards the hand and fingers, i.e., a finding consistent with the diagnosis of carpal tunnel syndrome. In three of these workers there was no evidence for abnormal functioning of the median nerve proximal to the wrist nor of abnormal function in other nerves.

The NCVT done in early 1981 for the fourth person was interpreted to be consistent with bilateral median neuropathy. In late 1981 repeat tests found median nerve function to be within normal limits. The 1981 test for the fifth person was also interpreted to be consistent with a very mild sensory neuropathy based on "borderline slowing of the ulnar nerve through the elbow" and "slight slowing of the right sural nerve." NIOSH has recommended that this person have repeat testing and continued careful evaluation. A series of NCVT have been done in 1982 for the sixth person. There was slow ulnar nerve conduction across both elbows. However, there was not evidence of generalized peripheral neuropathy.

Epidemiologic investigation found very little objective evidence which would indicate that the reported neurologic symptoms may have been caused by a common exposure, and the clinical features do not fit a recognizable pattern associated with toxic neuropathy. At least 6 of the persons reporting symptoms were diagnosed as having carpal tunnel syndrome (CTS). Carpal tunnel syndrome may be job-related, but this is usually due to ergonomic factors rather than chemical exposures. It is possible that the findings of nervous system dysfunction similar to CTS may represent very early manifestations of a toxic neuropathy, but this is very unlikely as we were unable to identify any substance, historically or by direct measurement, that might have this effect.

VIII. CONCLUSIONS

Neither the results of NCVT nor the pattern of symptoms reported by the workers at LCC suggested that there was a common pathophysiological process occurring in peripheral nerves. In light of consistently negative environmental sampling results on the days and under the conditions the sampling was conducted, we feel that it is extremely unlikely that a neurotoxic substance has been responsible for the patterns and distribution of the reported symptoms.

IX. RECOMMENDATIONS

1. Prohibit all gas and diesel motor vehicles from entering the area by the laundry because the air intake for the ventilation system is located there. This should include small maintenance vehicles, mopeds and motorcycles which are parked by students under the breezeway.

2. A change in the air intake location could reduce the probability of bringing airborne contaminants into the ventilation system.

3. If oily rags and mops are washed, they should be washed on Saturday afternoons and the times of these washes should be posted in the building. A preferrable option is to discontinue washing these products in the LCC laundry.

4. Install a shroud or hood over the autoclave in the dental clinic and exhaust it directly outside.

5. Install an exhaust fan and exhaust the air directly to the outside. Keep the darkroom slightly negative in pressure relative to the dental clinic atmosphere. In this manner any substances released in the darkroom would not be able to go into the dental clinic or into the building's recirculated air.

6. A local exhaust hood or hoods should be installed in the first floor dental lab. All chemicals should be mixed and used in these hoods. Not only would this protect the dental hygiene students, it would prevent the chemicals and odors from being distributed throughout the entire building.

7. Continue to have the dental lab classes do all work with chemicals in the science building until the local exhaust hoods are installed in the dental lab (room 108).

8. The liquid laundry detergent "Diligent" contains a large proportion of kerosene. Individuals in the building state that they can detect the kerosene odor in the breezeway and areas outside the building when "Diligent" is used. Because of the present concern about odors, it is suggested that a product that does not contain kerosene be used in place of "Diligent."

9. Maintain a positive pressure in all other rooms of the building relative to the outside atmosphere. This should be checked on a periodic basis.

10. Each worker with symptoms deserves careful evaluation and diagnosis. Symptomatic workers should continue to consult with their own physicians. It will be helpful to both physicians and patients to know that the reported symptoms do not seem to be related to a common toxic exposure. Diagnostic efforts can be focused on more likely etiologic possibilities.

X. REFERENCES

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3. Spencer, P.F., Schaumburg, H.H. Experimental and clinical neurotoxicology. Williams and Wilkins: Baltimore, 1980.

XI. AUTHORSHIP AND ACKNOWLEDGEMENTS

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XII. DISTRIBUTION AND AVAILABILITY OF REPORT

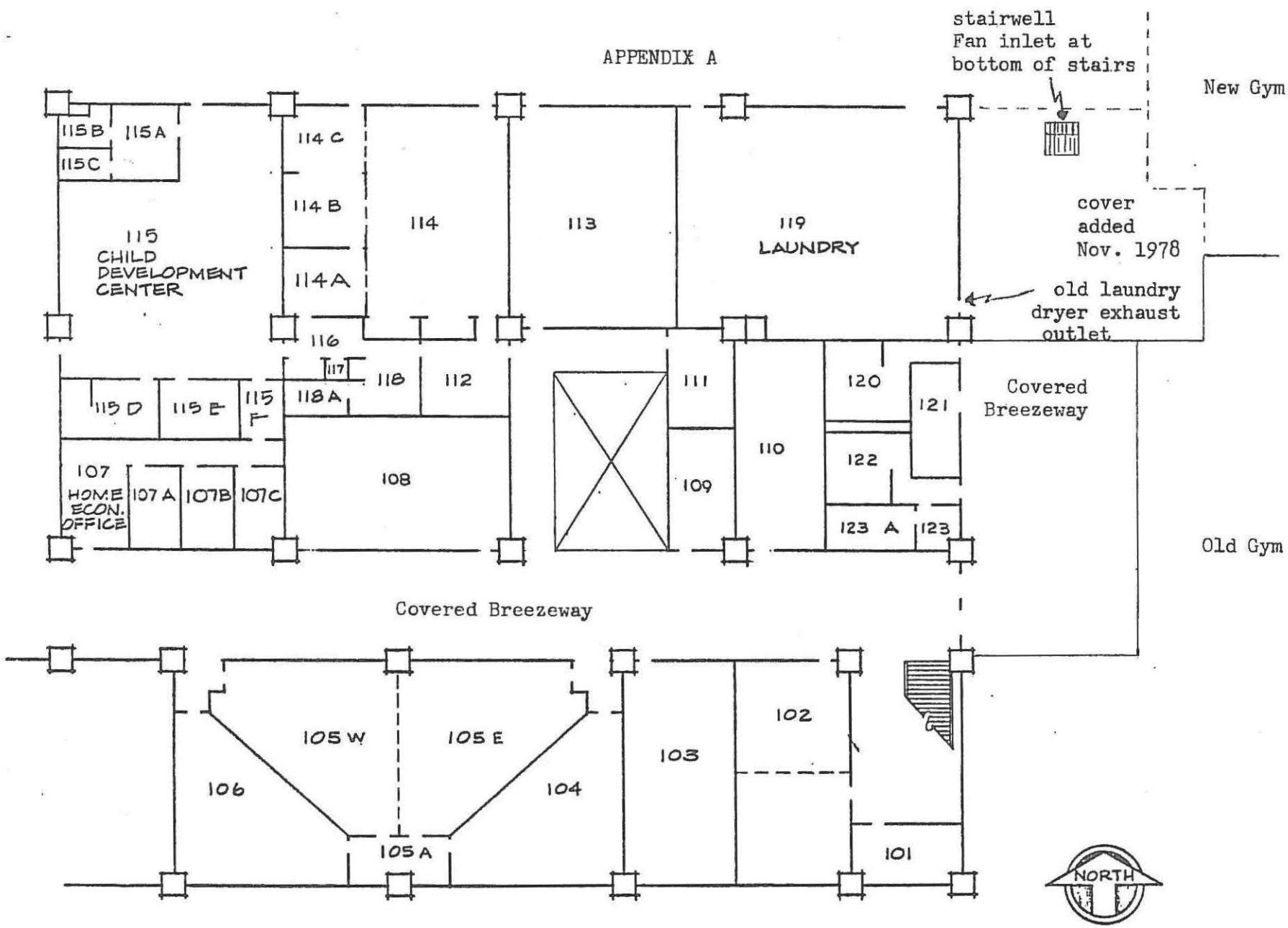
Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report

will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. Lane Community College, Eugene, Oregon
2. Lane Community College Education Association, Eugene, Oregon
3. Oregon State Accident Prevention Division, Salem, Oregon
4. U. S. Department of Labor, Occupational Safety and Health Agency (OSHA), Region X, Seattle, WA
5. National Institute for Occupational Safety and Health, Region X, Seattle, WA

For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

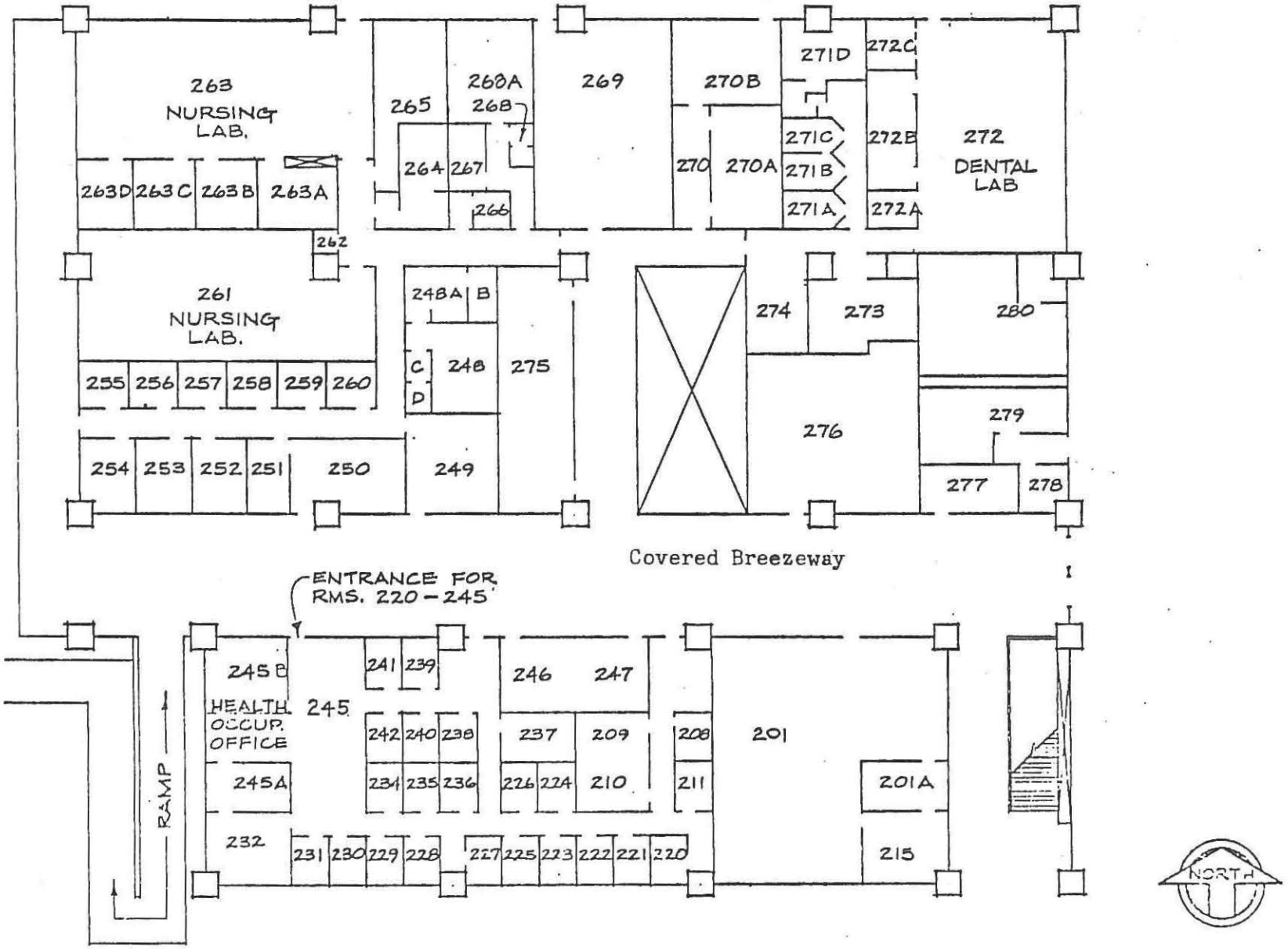
APPENDIX A



HEALTH TECHNOLOGY BLDG.
NO. 12 - LOWER FLOOR PLAN

DRAWING REVISED: JAN. 1980

SCALE LINE: 0 10 20 30 40



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NO. 12 - UPPER FLOOR PLAN

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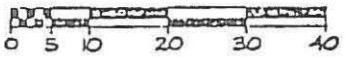

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