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

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO.77-68-417

THE WASHINGTON POST COMPANY
WASHINGTON, D.C.

AUGUST 1977

I. TOXICITY DETERMINATION

Worker exposure to specific substances found in the workplace did not constitute a health hazard at the time of this survey. This determination is based on environmental measurements of contaminants, observation of work practices and a review of the pertinent literature. However, confidential employee interviews did indicate that some workers experienced discomfort to intermittent conditions in the work place. Recommended preventive measures are presented in this report.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. 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:

a) The Washington Post Company, Washington, D.C.
b) Authorized Representative of Columbia Typographical Union, Local 101
c) U.S. Department of Labor, Washington, D.C.
d) NIOSH - Region III

For the purpose of informing the approximately 30 "affected employees" the employer shall promptly "post", for a period of 30 calendar days, the Determination Report in a prominent place near where exposed employees work.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1976, 29 U.S.C. 669(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 received such a request from an authorized representative of the Columbia Typographical Union of Local 101, of the Washington Post Company, Washington, D.C., regarding employees' exposure to burning oil. He had been made aware of the potential problem by complaints voiced by several employees. The alleged hazard was confined to the area of the fourth floor known as the Machinists Area/Composing Room.

IV. HEALTH HAZARD EVALUATION

A. Description of Process - Conditions of Use

The Washington Post Company is a newspaper publishing firm with a circulation of 558,000 daily and 750,000 on Saturday and Sunday. The company has been at the same facility since 1954. It is a 7 day-a-week, 24 hour, 3 shift operation with the majority of the workers present during the 2:00 p.m. - 8:45 p.m. shift during which the next morning's distribution deadline is met. The specific area of request was the Machinists Area/ Composing Room, whose workers provide material and maintenance for the linotype operators and composing room personnel.

The majority of area in the composing room is allocated for arrangement and composition of newspaper type for setting pages (make-up area). The remainder contains approximately 20 manually operated linotype machines and 16 computer operated linotype machines. The computer is also located here but is enclosed in a room by itself.

The Machinists' Area, where the request originated, is a room (approximately 40 feet long, 20 feet deep and a ceiling height of 10 feet) located off the main composing room, next to the make up area and opposite the linotype area (see Diagram I).

In the Machinists Area, separated by a waist high partition, are located seven casting machines for casting spacing material - four Elrod and three Monotype casting machines. (Spacing material are bars of lead cast in various widths and lengths and used to separate type into lines and columns on a newspaper page.) The area containing the casting machines is approximately 8 feet X 20 feet. The remainder of the Machinists Area is a staging area where the machinists repair or clean parts of the linotype

machines from the Composing Room floor, or wait until a signal light indicates that a machinist is needed on the Composing Room floor. This area contains a work bench, tool boxes, storage bins for spacing material and letters, a sink and a drill press.

This area is ventilated by a blower (for air conditioning and heat) located on the wall approximately 6 inches from the ceiling and blowing the length of the casting area. An exhaust port is located in the ceiling at the other end of the casting area. There are two other ceiling exhaust vents located on the far side of the room equidistant from the walls (see Diagram II).

Products used in the Machinists Room are lead "pigs" for producing spacing material, oils for lubricating the hot metal as it passes through the mold and a solvent for cleaning machine parts. Table I lists the names and approximate compositions of the products used.

The classification and work procedures of the exposed workers are as follows. All workers are classified as machinists and are production personnel. There are two types of jobs performed by these machinists - operation and repair of the Monotype and Elrod casting machines, and maintenance of the linotype machines in the Composing Room. Some machinists, depending on their assignment for the day, are responsible for maintenance of the computer in the separate computer room. (During this survey those machinists working in the computer room were not sampled.)

The first shift at full strength has 2 casting machine operators and 2 mainentance men. The second shift at full strength has 2 casting machine operators and 11 maintenance men; third shift 2 casting machine operators and 11 maintenance men.

Some combination of Elrod and Monotype machines are operated continuously during all three shifts, since the material produced by these machines is not produced for immediate use but produced to keep a good backlog or inventory to be used when needed. The operator hooks lead pigs to a mechanical feeder which keeps a constant level of molten lead in the electrically heated pot. The molten lead (approximately 600° F) is extruded through a mold which is water cooled and oil lubricated. After a certain length is extruded it is cut off and another piece is formed. The operator waits until a stack of spacing material is produced and then hand carries the material to the storage bins located on the other side of the partition. The procedure is the same for all seven casting machines.

Work routine varies if the operator has to (1) change a mold for another size spacing material, (2) clean mold and machine when it "squirts" (the lead gets too hot and runs through the mold and spills on the machine), or (3) cart spacing material to bins on the Composing Room floor. The maintenance men are in charge of repairing the linotype machines if they break down during operation - primarily during the first and second shift. The cleaning of the machines is mostly done during the third shift. The maintenance men have the option of staying in the Machinists Area or on the Composing Room floor when they are waiting for a machine to break down. There is a system of red lights on each linotype machine which the linotype operator turns on if his machine jams. This system is also in the Machinists Area to alert any machinist there. Generally, if a machine jams it only takes seconds to repair it; more complicated problems take longer. Occasionally it is necessary to remove a piece of machinery to the Machinists Area for cleaning or repair.

The magnitude of work which the machinists do and the number of casting machines operating depends on the time of day relative to the evening's deadline. That is, the number of casting machines in operation and the demand for machinists' services increases as the evening deadline approaches, and then declines after the deadline is met.

B. Design and Progress

The investigation was conducted on April 25-26, 1977. An initial conference and a walk through of the area containing the alleged hazard was held the afternoon of the 25th. Environmental sampling was set up for shifts 1 and 2 of April 26th. Environmental samples were taken for lead, tin, antimony, oil mist, and associated vapors. Bulk samples of the oils and solvents used were obtained for qualitative analysis. Samples of carbon monixide and carbon dioxide were also taken. Brief non-directed medical questionnaires were administered to those employees sampled. Shift 3 was not sampled since it was felt that a representative sample could be obtained from shifts 1 and 2. If contaminant concentrations in excess of recommended criteria were exceeded then follow up sampling would be conducted to include the third shift.

C. Environmental Evaluation Methods

1. Area samples for lead were collected on 37 mm, 0.8 micrometer cellulose membrane filters utilizing a 3 piece filter cassette with the plug removed, and a Model G Mine Safety Appliance (MSA) vacuum pump operated at 2 liters per minute.

Analysis was accomplished by atomic absorption spectrometry using the appropriate flame and analytical wave length.[1]

2. Area samples for tin and antimony were collected by the above method for lead. Analysis was identical except for the addition of 1 ml of sulfuric acid to facilitate ashing and analysis by atomic absorption spectrometry with nitrous oxide.

3a. Charcoal tube samples were taken directly over the two bulk oils to determine if any volatile hydrocarbons were present. The generated samples were desorbed by carbon disulfide and analyzed by gas chromatography.

3b. Solutions of the oils and the solvent were dissolved in carbon disulfide and analyzed by gas chromotography.

4. Personal environmental samples for oil mist were collected on 37 mm, 0.8 micrometer cellulose membrane filters utilizing a 2 piece open faced filter cassette with a Model G MSA vacuum pump operated at 2 liters per minute. Analysis was accomplished by fluorescence spectrophotometry.[2]

5. Personal environmental samples for oil vapor were collected on 100/50 mg charcoal tubes with a Sipin pump operating at 200 milliliters per minute. Analysis for specific constituents was accomplished by gas chromotography.[3]

6. Carbon monoxide and carbon dioxide were measured with a NIOSH certified Drager pump and detector tubes. The lower limits of detection of these tubes are 5 ppm and 5000 ppm, respectively.

Over both shifts, five personal samples for oil mist and general area samples for lead and tin/antimony were taken. Personal samples were taken in the breathing zone of the worker. Area samples for lead and tin/antimony were taken side by side for each location. All samples were changed and new collecting media installed at approximately half the shift.

7. Non-directed medical questionnaires were administered to all personnel who assisted the investigator in the environmental survey. Employees were asked about their employment history, if they had any medical problems and if they felt they were occupationally related.

D. Evaluation Criteria

1. Physiological Effects

The following is a brief summary of the adverse effects that may result from excessive exposure to each of the substances of concern:

Lead - Industrial exposure to lead occurs mainly as ingestion of dust particles and/or inhalation of dust and fume. Signs and symptoms of lead poisoning may include abdominal pain, constipation, weakness, loss of appetite, nausea, vomiting, weight loss, anemia with pallor, metallic taste in mouth and headache.[4] Chronic exposure to lead compounds can cause progressive and irreversible kidney impairment.[5]

Tin - Industrial exposure routes are inhalation or ingestion of tin dust. Prolonged inhalation of tin oxide dust can cause a nonprogressive and nondisabling condition known as stannosis, a pseudo-nodulation in the lungs.[6]

Antimony - Industrial exposure occurs by inhalation or ingestion of dust or fume. Ingestion may produce gastrointestinal irritation, vomiting and diarrhea. Inhalation of antimony dust can cause acute pneumonitis. Symptoms of chronic poisoning are lassitude, irritability, nausea, constipation, pain in joints, reduction in white blood cell count in blood, muscle pain, and inflamation of the oral mucosa. Acute poisoning can cause death by circulatory or respiratory failure.[7]

Carbon Monoxide and Carbon Dioxide - Industrial exposure occurs by inhalation of the gases. Carbon monoxide interferes with the oxygen carrying capacity of the blood which may result in a state of tissue hypoxia. Symptoms include headache, fatigue and dizziness. The intensity of symptoms is related to the degree of exposure. Large concentrations (30,000 ppm) of carbon dioxide are required before any adverse health effects are noted.[8]

Oil Mist and Oil Vapor - Industrial exposure occurs by inhalation and skin contact. Inhalation of high concentrations of oil mists will cause mucous membrane irritation. Prolonged or repeated skin contact will cause irritation and dermatitis.[9]

2. Environmental Evaluation Criteria

In order to evaluate a workers' exposure to substances found in the workplace, values have been derived, based on the best available information from industrial experience, human and animal toxicity studies, which refer to airborne concentrations of the substances to which it is believed that nearly all workers may be repeatedly exposed day after day with adverse effect.

Values are generally presented as recommended limits or criteria based upon time-weighted average concentrations of the contaminant for a normal 8-hour workday or 40 hour workweek.

Because of wide variation of individual susceptibility, a small percentage of workers may experience discomfort from some substances at concentrations at or below the recommended value; a smaller percentage may be affected more seriously by aggravation of a pre-existing condition or by development of an occupational illness.

In this study, three sources of criteria were used: (1) NIOSH Criteria for a Recommended Standard for Occupational Exposure to Substances (Criteria Documents); (2) recommended and proposed threshold limit values (TLV's) and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH), 1976; and (3) Occupational Health Standard as promulgated by the U.S. Department of Labor (29 CFR 1910.1000).

In the following tabulation of criteria, the most appropriate values in the opinion of the author are presented with reference. It is the author's opinion that the lowest recommended criteria be accepted since each established limit can be achieved by existing technology and all workers should be provided with safe and healthful working conditions to the greatest extent possible.

Substance	Permissible Exposures 8 hr. Time Weighted Average
Lead[a]	0.10 mg/M^3*
Tin (oxide)[b]	10.00 mg/M^3
Antimony (trioxide)[c]	0.50 mg/M^3
Oil Mist[d]	5.00 mg/M^3
Carbon monoxide[e]	35 ppm**
Carbon dioxide[f]	5000 ppm

*Units of measured concentrations: mg/M^3 - milligrams of substance per cubic meter of air.

**Units of measured concentrations: ppm - parts of substance per million parts of contaminated air by volume.

[a]Reference: 40 Federal Register 45934, October 3, 1975. Limit proposed by OSHA and supported by NIOSH.

[b]Reference: 1976 ACGIH TLV.

[c]Reference: 1976 ACGIH TLV and OSHA standard.

[d]Reference: 1976 ACGIH TLV and OSHA standard.

[e]Reference: 1972 NIOSH Critria Document for Occupational Exposure to Carbon Monoxide.

[f]Reference: 1976 ACGIH TLV and OSHA standard. NIOSH Criteria Document (1976) recommends 10,000 ppm.

E. Evaluation Results and Discussion

1. Environmental

On the basis of the environmental sampling performed in this survey, it is concluded that worker exposure was not in excess of the recommended criteria for the substances listed above.

All samples taken were below the recommended criteria for this evaluation; levels of tin/antimony were below the limits of detection for the analytical method used. For a detailed description of all environmental samples taken, refer to Table II.

2. Medical

The non-directed medical questionnaires administered to five workers revealed that some workers experienced some irritation - tightness in chest, difficulty in breathing - when exposed to the smoke and vapors generated by the casting operation. Three workers (including one part-time employee) had obtained letters from the company's medical consultant stating that they were allergic to the generated products and could not be required to work in the Machinists Room. The workers interviewed stated that they were most affected when a mold was being changed or when there was a squirt. (This investigator observed both procedures and noted that there was a relatively large volume of contaminants introduced into the atmosphere. Visible signs at the emission site remained approximately 10-20 seconds and then dissipated.) The effect of oil fume from partial heat decomposition has yet to be completely evaluated experimentally. The few data that are available indicate that heat decomposed oil fumes are irritating to the lungs.[10] However, since there were no environmental measurements in excess of the recommended criteria, it is felt that the physiological stresses reported by the subject workers may be due to individual susceptibility. Some workers may experience discomfort to conditions that do not affect others as was evident from talking to the workers.

Based on the information obtained from environmental sampling, observation of work procedures and employee interviews, the following recommendations are offered:

1. It was observed that the work routine of the employees under this health hazard consideration (with the exception of the casting machine operators) did not require them to be in the Machinists Room a specific portion of their work day or to be in there during a certain time of the work day. Therefore, the workers who are experiencing discomfort can leave the room during periods of greater contaminant generation. It is believed that this would not interfere with the work since the periods of excessive smoke generation are infrequent and shortlived.

2. The pedestal fan in use during this survey defeats the purpose of the ventilation system over the casting machine area. If this fan must be used there, it should be placed by the wall opposite the casting area so that it aids rather than hinders the air flow out the ceiling exhaust duct.

3. Better compliance with Rule #3 of the composing room machine shop safety rules, issued March 30, 1973, which states "all persons assisting in or observing the operation of shop equipment shall wear protective shields or glasses". It was noted that some machinists, although not operating equipment, were in the vicinity of the casting operations without safety eye wear.

4. It was noted that, after a "squirt" and the solidified lead was chipped loose, the remaining particles were removed by an air pressure hose. Cleaning by air pressure is regarded as an unsafe practice, from the standpoint of increasing the atmospheric concentration of lead dust, increasing the chances of ingestion of larger particles and increasing the hazard of getting particles in the eyes. Also, this investigator was told that the floor was cleaned by sweeping. This practice can also increase the atmospheric concentrations of contaminants. A safer practice would be to substitute vacuuming for air blowing or sweeping.

5. It is the judgment of this investigator that the Washington Post Company provides the machinists with fairly safe and clean conditions in which to work. However, it should be kept in mind that if further workers experience distressing symptoms attributable to the casting operation, then other controls may have to be considered. These may range from installing the top half of the partition to further isolate the casting operation from the rest of the Machinists Area (and thereby channeling the air flow of the ventilation system and increasing its capture velocity) to the installation of specific ventilation for each casting machine.

V. REFERENCES

1. NIOSH Manual of Analytical Methods #173, U.S. Department of Health, Education and Welfare, Public Health Service, 1974. Revision date January 15, 1974. Classification B (accepted).

2. NIOSH Manual of Analytical Methods #159, Depart of Health Education and Welfare, Public Health Service. Revision date January 10, 1974. Classification D(operational).

3. NIOSH Manual of Analytical Methods #127, DHEW, PHS. Revision date July 15, 1974. Classification: variable.

4. Occupational Diseases, A Guide to their Recognition, Gafafer, W.M. D. Sc., ed. Department of Health Education and Welfare, Public Health Service, 1964.

5. Occupational Exposure to Inorganic Lead, NIOSH, Department of Health Education and Welfare, Public Health Service, 1972.

6. Occupational Diseases, cp cit.

7. Ibid.

8. Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1976, American Conference of Governmental Industrial Hygienists.

9. Ibid.

10. Wagner, W.D., Dobrogorski, O.J., Stokinger, H.E., Archives of Environmental Health 2, 523, (1961).

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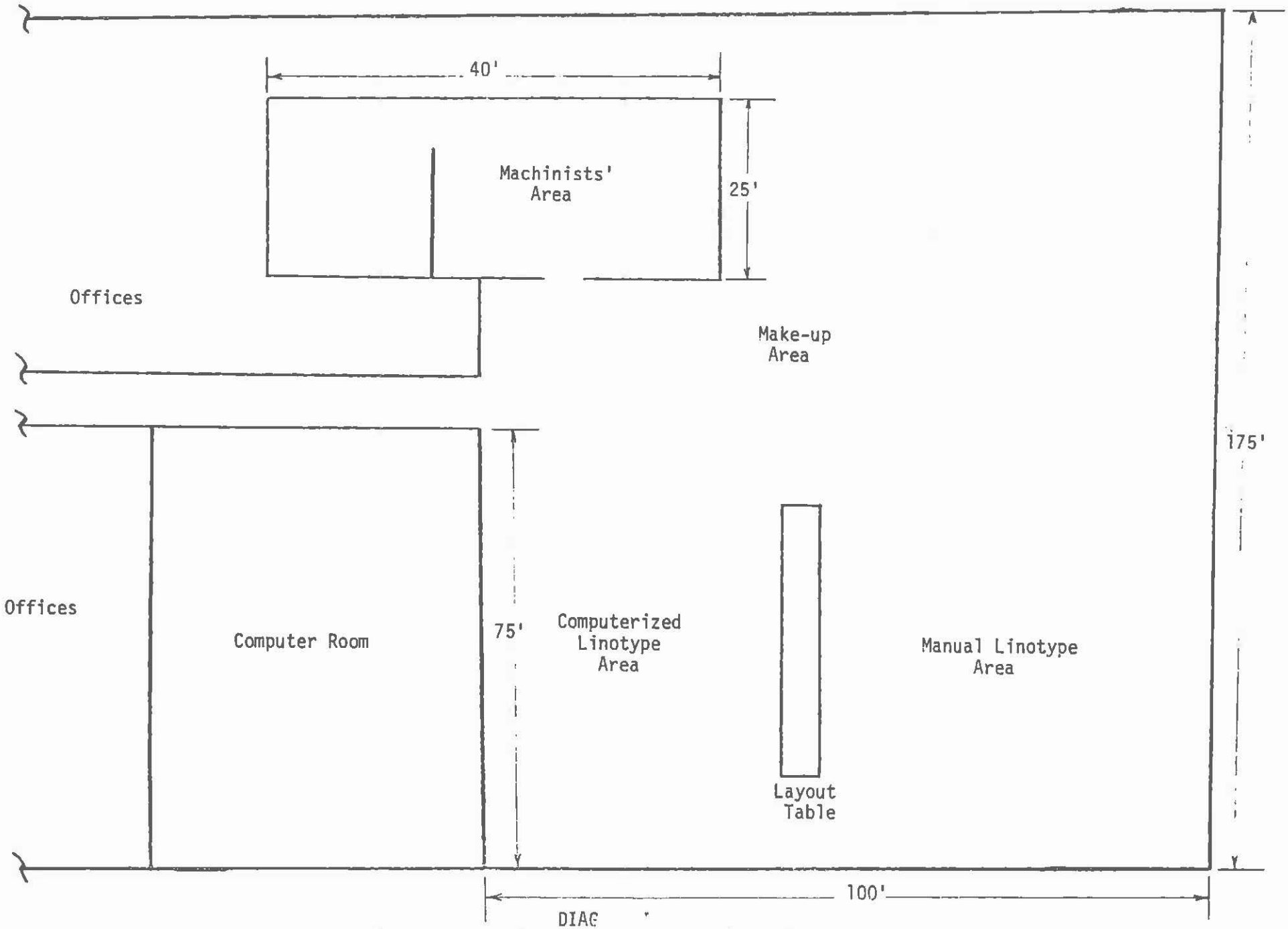

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Layout of Fourth Floor Composing Room with Approximate Dimensions

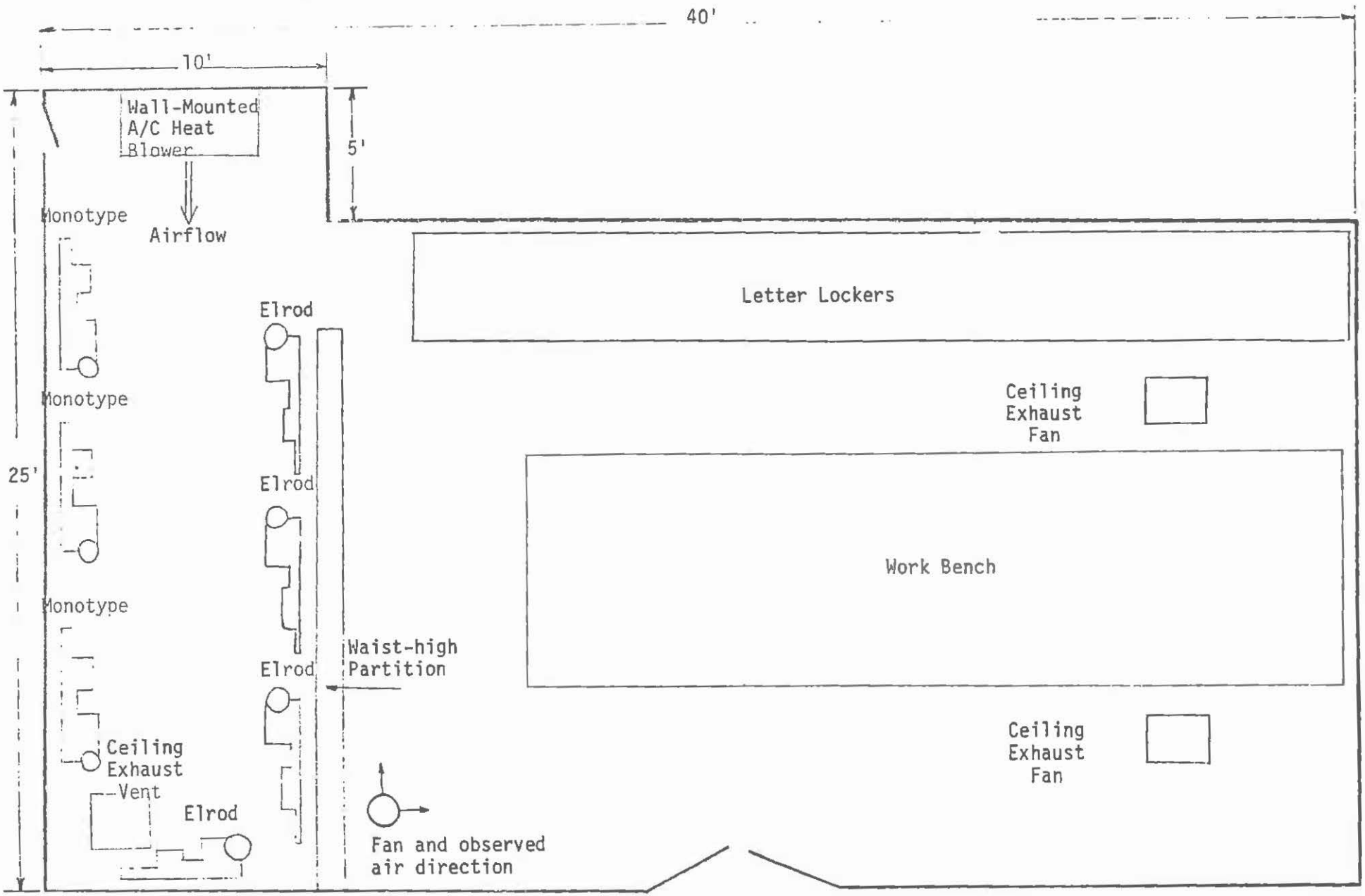

DIAGRAM II
Layout of Machinists' Area with Approximate Dimensions

TABLE I

Products Used and Approximate Compositions

Product	Constituents	Approximate % of Total
Lead Pigs	Lead	87-89%
	Tin	3-4%
	Antimony	8-9%
Rule Mold Oil	High boiling hydrocarbons	Unknown
Elrod Mold Oil	High boiling hydrocarbons	Unknown
Film Kleen (Cleaning solvent)	Ink solvents, mostly C_7 & Cn hydrocarbons	Unknown
	Static Eliminator	Unknown
	Isopropanol	Trace
	Benzene	Trace
	Toluene	Trace

TABLE II

Substances Sampled for and Concentrations Found
Machinists' Area

Job &/or Location	Sample Time (min.)	Sample Volume (M^3)	Concentration (mg/M^3) Lead	Tin/antimony	Oil Mist	Total Alkanes	Benzene	Toluene	Isopropanol
Machinists Area General Area	364	0.73	0.01						
"	366	0.73	0.01						
"	304	0.61	*LD						
"	304	0.61	0.01						
"	301	0.60	LD						
"	304	0.61	0.01						
"	368	0.74	LD						
"	368	0.74		LD					
"	366	0.73		LD					
"	364	0.73		LD					
"	304	0.61		LD					
"	304	0.61		LD					
"	301	0.61		LD					
"	304	0.61		LD					
Monotype Operator	319	0.64			3.02				
Machinist	219	0.40			0.40				
"	324	0.82			0.72				
"	358	0.79			0.27				
Operator	349	0.78			1.65				
Machinist	353	0.07				22.86	L.D.	L.D.	L.D.
"	252	0.05				22.00	L.D.	L.D.	L.D.
Operator	426	0.08				18.75	L.D.	L.D.	L.D.
Machinist	409	0.08				8.13	L.D.	L.D.	L.D.

* Below Analytical Limits of Detection.