U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
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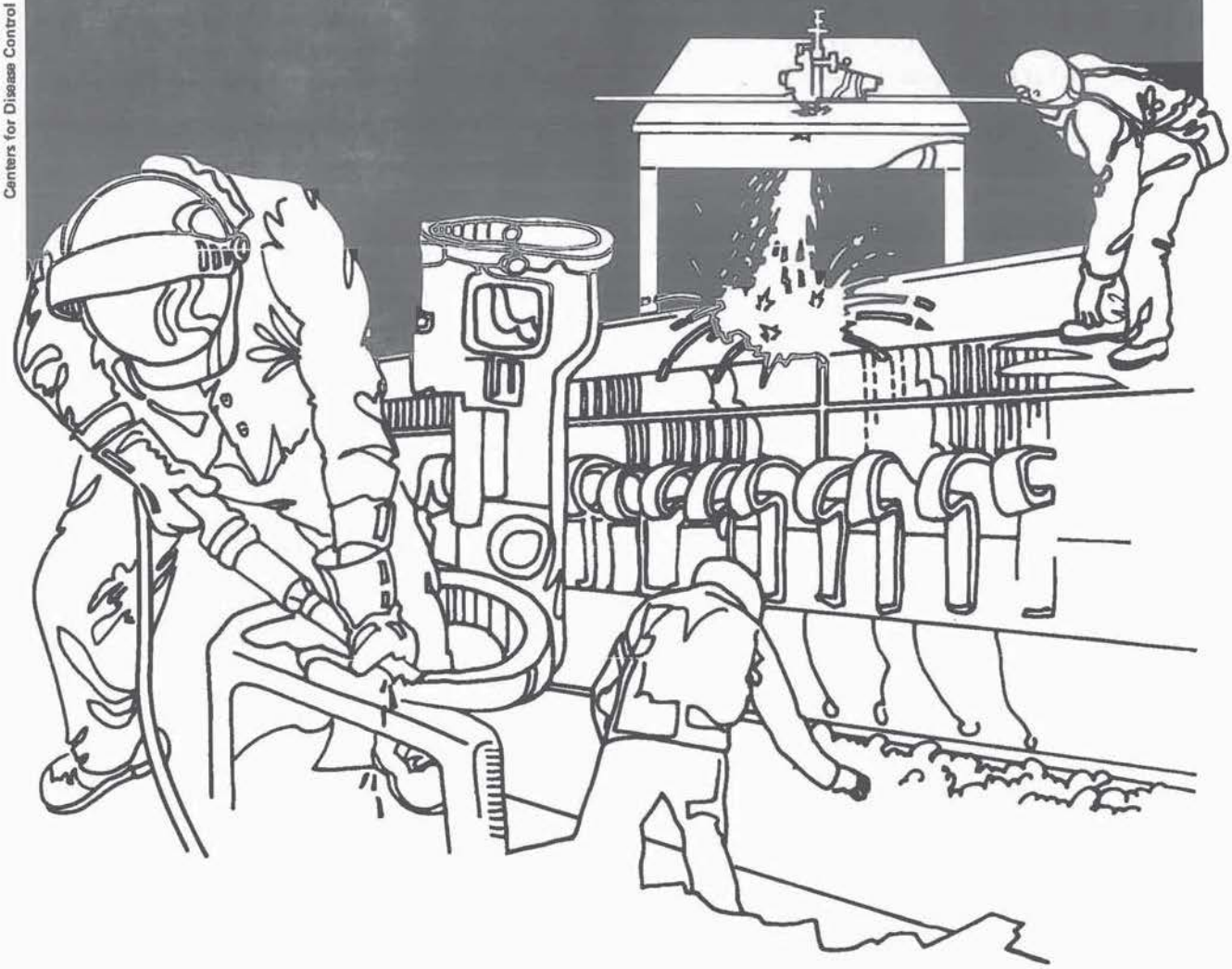
NIOSH



Health Hazard Evaluation Report

HETA 81-065-938
METRO BUS MAINTENANCE SHOP
WASHINGTON, D.C.

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 81-065-938
August 1981
METRO Bus Maintenance Shop
Washington, D.C.

NIOSH INVESTIGATORS:
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I. SUMMARY

In November 1980, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation at the METRO Bus Maintenance Shop, Washington, D.C. The request indicated that employees working in the soldering, welding, painting, and degreasing areas were experiencing headaches, dizziness, upper respiratory irritation, and excessive fatigue. About 17 employees work in these four areas where buses and bus parts are reconditioned and repaired.

On January 22-23, 1981, thirty-three personal and area air samples were taken in four of the maintenance areas. Analysis of these samples indicated that the solderers were exposed to less than 30% of the environmental criteria for: lead, iron, manganese, nickel, cadmium, vanadium, chromium (III), copper, and hydrazine. Analysis of air samples in the welding area indicate that the concentration of nickel on one of three samples (0.017 mg/M^3) exceeded the NIOSH recommended criteria of 0.015 mg/M^3. Although the data is limited, the welders are at increased risk of overexposure to inorganic nickel. Under the performance of the existing ventilation controls, the exposures would probably increase with a corresponding increase in the amount of stainless steel being welded. Exposure of the welders to iron, lead, manganese, cadmium, vanadium, chromium (III), copper, ozone, and inorganic fluorides did not exceed 20% of referenced environmental criteria. Exposure of painters to methylene chloride, methanol, 2-nitropropane, toluene, benzene, xylene, dichlorobenzene, perchloroethylene, 1,1,1-trichloroethane and chromium (VI) did not exceed 10% of the concentrations of referenced environmental criteria. Degreasers exposure did not exceed 30% of environmental criteria to dioxane, 1,1,1-trichloroethane, trichloroethylene, carbon tetrachloride, carbon disulfide, dichloroethyl ether, and methylene chloride.

On the basis of the data obtained in this investigation, NIOSH has determined that a health hazard did not exist from over exposure to chromium (VI), copper, iron, lead, manganese, cadmium, vanadium, chromium (III), 1,1,1-trichloroethane, trichloroethylene, carbon tetrachloride, ozone, fluoride, carbon disulfide, dichloroethyl ether, hydrazine, methylene chloride, methanol, 2-nitropropane, toluene, benzene, xylene, dichlorobenzene, perchloroethylene, dioxane and carbon monoxide on the day NIOSH sampled. However, welders may be at an increased risk of exposure to excessive airborne concentrations of nickel. Recommendations to improve work practices concerning to welding, painting, and the maintenance of the ventilation systems are contained in section VII of this report.

KEYWORDS: SIC (4171): Bus maintenance (painting, welding, soldering, degreasing); solvent exposure (1,1,1-trichloroethane, trichloroethylene, carbon tetrachloride, carbon disulfide, dichloroethyl ether, methylene chloride, methanol, 2-nitropropane, toluene, benzene, xylene, dichlorobenzene, perchloroethylene, dioxane); chromium (VI); copper; lead; manganese; nickel; cadmium; vanadium; chromium (III); ozone; inorganic fluorides; hydrazine; carbon monoxide.

II. INTRODUCTION

On November 13, 1980, the National Institute for Occupational Safety and Health (NIOSH) received a request from METRO Bus Maintenance Shop, Washington, D.C., to evaluate reports of headaches, dizziness, excessive fatigue, and upper respiratory irritation among several employees. These symptoms were thought to be related to chemicals used and fumes generated, in four areas of the maintenance shop including soldering, welding, painting, and degreasing.

III. BACKGROUND

METRO Bus maintenance repair shop is used to recondition buses in the Washington, D.C. metropolitan area. The health hazard evaluation involved four areas of the Maintenance Shop; each of which performs work on an as-needed basis.

The soldering area performs testing on bus radiators by submerging them in water. The holes are then soldered under local exhaust. Soldering is done most of the day by three workers.

The degreasing operation is located in a room with a separate ventilation system to prevent contamination of adjacent areas. Parts are placed by the two employees into solvent baths containing various solvents including 1,1,1-trichloroethane, dichlorobenzene, trichloroethylene, carbon disulfide, and carbon tetrachloride for degreasing. The parts are then removed and stacked to air dry, before being used in the reconditioning process.

Welding is performed by two workers under local exhaust hoods. The welding operation is a cyclical process; during the survey dates not much welding was done.

Painting operations occurred, like welding, occasionally during the survey period. Several different paint mixtures were used, each of which lasted only several minutes. Painting was performed by only one of eight painters, using a compressed air spray gun. Depending on part sizes, spraying was performed both inside and in front of a dry spray booth.

IV. EVALUATION DESIGN

Environmental air monitoring was conducted in the Maintenance Shop on January 22-23, 1981. Exposures to various contaminants were evaluated including four inorganic compounds, nine metals, and 14 organic compounds. The contaminants were monitored using standard personal

and/or workplace sampling techniques. The sampling and analytical methodologies are presented in Table I. Air velocity measurements of the seven local exhaust hoods and one paint spray booth were determined using a constant temperature thermal anemometer.

V. EVALUATION CRITERIA

Environmental standards and criteria considered applicable to this evaluation are shown in Table I. These criteria and standards were established at levels to protect workers occupationally exposed to a substance on an 8- or 10- hour day, 40-hour per week basis over a normal working lifetime. Ceiling values, given in Table I, are concentrations that should not be exceeded along with the corresponding time limit.

Solvents:

Exposure to inorganic solvent vapor can cause varying degrees of anesthesia, with minimal levels causing headaches, and greater exposure causing lightheadedness, "drunkedness", and even unconsciousness. Additionally, they may have a somewhat disagreeable odor and be irritating to eyes, nose and throat. Skin contact with the solvents, particularly on a prolonged or repeated basis may remove natural oils from the skin causing dryness and cracking.

Nickel:

Metallic nickel can cause sensitization (allergies) dermatitis known as "nickel itch". Nickel dust may cause nasal or lung cancer in humans; and nickel fume in high concentrations is a respiratory irritant.

VI. RESULTS AND DISCUSSION

A. Soldering

Table III presents exposure data of solderers to iron, lead, manganese, nickel, cadmium vanadium, chromium (III), copper, and hydrazine. None of the workers in the soldering area were exposed to any concentration of any chemical greater than 15% of any referenced occupational health criteria.[2,4,13,18,20,21]

The face velocities of the three hoods used on the soldering tanks ranged from 1500 feet per minute (FPM) to 2000 FPM. These velocities, during the survey dates, were adequately controlling the contaminants listed above.

B. Welding

Table IV provides exposure data of welders to iron, lead, manganese, nickel, cadmium, vanadium, chromium (III), copper, ozone and inorganic fluoride. One of three samples obtained on a welder for nickel showed a concentration of airborne nickel (0.017 mg/M^3) in excess of the NIOSH recommended standard (0.015 mg/M^3). Although the data is limited, it shows that the welders may be at increased risk of overexposure to nickel which may increase with increased welding output. None of the airborne concentration of any other substances sampled in the welding area exceeded 20% of referenced occupational health criteria.(2,4,10,13,18,20,21)

Face velocities of local exhaust hoods used by two welders ranged from 20 to 80 feet per minute (FPM). These air velocities are considered substandard and should be modified to better control welding fumes, especially nickel.

C. Painters

None of the painters were exposed (Table V) to airborne concentrations of methanol, 1,1,1-trichloroethane, toluene, benzene, chromium (VI), xylene, dichlorobenzene, 2-nitropropane, methylene chloride, or perchloroethylene that exceeded 5% of referenced occupational health criteria.(3,8,11,12,14,15,17,20,21)

Ventilation measurements taken on the paint spray booth indicated an average face velocity of approximately 75 FPM (range of 50 to 100 FPM). Dry type spray booths should maintain an average air velocity over the open face of the booth of not less than 100 FPM. Air measurements obtained when spraying outside of the paint spray booth indicate velocities of approximately 10-20 FPM.

D. Degreasing

The employees in the degreasing area were not exposed to any concentration (Table VI) greater than 5% of the referenced occupational health criteria of 1,1,1-trichloroethane, methylene chloride, dioxane, trichloroethylene, carbon disulfide, or dichloroethyl ether. The maximum carbon tetrachloride exposure of 3.8 mg/M^3 was 30% of the NIOSH Occupational health criteria of 13 mg/M^3. (5,7,9,12, 15, 16, 20,21)

VII. RECOMMENDATIONS

1. Discontinue the spray painting of bus parts (e.g., bumpers) outside of appropriately ventilated spray booths. Perform spraying of pieces that will not fit into the spray booth in one of the other two larger available booths.

2. Increase velocity of existing spray booth used during the survey to achieve a minimum average face velocity of 100 FPM. A visible gauge, audible alarm or pressure activated device should be installed on each spray booth to indicate or insure that the required air velocity is maintained. Check to determine if make-up air will be needed to balance air flows when doors to room are closed.

3. Increase velocities of welding hoods to provide adequate protection to welders to all possible contaminants occurring during the welding process.

4. Keep doors to degreasing room closed to maintain proper air balance of existing ventilation system. Determine if make-up air will need to be supplied into room with doors closed.

VIII. AUTHORSHIP AND ACKNOWLEDGEMENTS

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IX. DISTRIBUTION AND AVAILABILITY

Copies of this report are currently available upon request from NIOSH, Division of Technical Services, Information Resources 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 the NIOSH Publications Office at the Cincinnati address.

Copies of this report have been sent to:

1. METRO Bus Maintenance Shop, Washington, D.C.
2. Authorized Representative of Employees
3. U.S. DOL, Region III
4. NIOSH, Region III

For the purpose of informing the approximately 17 affected employees, a copy of this report shall be posted in a prominent place, accessible to the employees, for a period of thirty (30) calendar days.

X. REFERENCES

1. NIOSH Manual of Analytical Methods, Second Edition, Volumes 1-6. DHEW (NIOSH) Publication No. 77-157a, April, 1977.
2. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Inorganic Lead," Revised Criteria-1978, DHEW Publication No. (NIOSH) 78-158.
3. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Benzene." DHEW Publication No. (NIOSH) 74-137, 1974.
4. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Cadmium." DHEW Publication No. (NIOSH) 76-192, 1976.
5. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Carbon Disulfide." DHEW Publication No. (NIOSH) 77-176, 1977.
6. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Carbon Monoxide." DHEW Publication No. (NIOSH) HSM 73-11000, 1972.
7. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Carbon Tetrachloride." DHEW Publication No. (NIOSH) 76-133, 1975.
8. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Chromium (VI)." DHEW Publication No. (NIOSH) 76-129, 1975.
9. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Dioxane." DHEW Publication No. (NIOSH) 77-226, 1977.

10. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Fluoride." DHEW Publication No. (NIOSH) 76-103, 1976.

11. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Methanol." DHEW Publication No. (NIOSH) 76-148, 1976.

12. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Methylene Chloride." DHEW Publication No. (NIOSH) 76-138, 1976.

13. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Nickel." DHEW Publication No. (NIOSH) 77-134, 1977.

14. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Toluene." DHEW Publication No. (NIOSH) HSM 11023, 1973.

15. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to 1,1,1-trichloroethane." DHEW Publication No. (NIOSH) 76-184, 1976.

16. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Trichloroethylene." DHEW Publication No. (NIOSH) HSM 11025, 1973.

17. NIOSH "Criteria for a Recommended Standard... Occupational Exposure to Xylene." DHEW Publication No. (NIOSH) 75-168, 1975.

18. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Vanadium." DHEW Publication No. (NIOSH) 77-222, 1977.

19. NIOSH "Criteria for a Recommended Standard...Occupational Exposure to Carbon Disulfide." DHEW Publication No. (NIOSH) 77-156, 1977.

20. Occupational Safety and Health Standards for General Industry. U.S. Dept. of Labor (OSHA) Sec. 1910.1000 (Tables Z-1 and Z-2). July 1, 1980.

21. Threshold Limit Values for Chemical Substances and Physical Agents in The Workroom Environment, with Intended Changes for 1980. American Conference of Government Industrial Hygienists (ACGIH), 1980.

Table I

Exposure Criteria and Limit of Detection

METRO Bus Maintenance Shop
Washington, D.C.
January 22-23, 1981

Substance	Criteria (mg/M^3) NIOSH(1)	OSHA(2) TWA	ACGIH(3) TLV	LOD[4]
Benzene	3.2 (60 min. ceiling)	3.2 (16.0) (15 min. ceiling)	3.2	0.003
Cadmium	0.04 (10-hr TWA)	0.1 (3.0 ceiling)	0.05	0.001
Carbon Disulfide	3.0 TWA (30 ceiling)	60	30	0.002
Carbon Monoxide	38.5 (10-hr TWA)	55	55	----
Carbon tetrachloride	13 (1-hr ceiling)	65	65	0.01
Chromium (III)	--	--	0.05	0.005
Chromium (VI)	0.001	--	0.05	0.001
Copper	--	0.1	0.2	0.002
Dichlorobenzene	--	450	450	0.03
Dichloroethyl ether	--	90 (ceiling)	30	0.01
Dioxane	3.6 (30 min. ceiling)	360	180	0.02
Fluoride	2.5	2.5	2.5	0.003
Hydrazine	--	1.3	0.13	0.01
Iron	--	10	5.0	0.005
Lead	0.05	0.05	0.15	0.003
Manganese	--	5.0 (ceiling)	1.0	0.002
Methanol	260	260	260	0.01
Methylene chloride	261	1750	700	0.01
Nickel	0.015 (10-hr TWA)	1.0	1.0	0.003
2-nitropropane	--	90	90	0.01
Ozone	--	0.2	0.2	0.001
Perchloroethylene	339 (678 15 min. ceiling)	670	670	0.05
Toluene	375	750	375	0.01
1,1,1-trichloro-ethane	1910 (ceiling)	--	1900	0.01
Trichloroethylene	134	535	535	0.01
Xylene	434	434	435	0.03
Vanadium	0.05 (15 min. ceiling)	0.1 (ceiling)	0.5	0.015

* - mg/M^3 - Milligrams of substance per cubic meter of air

(1) NIOSH - National Institute for Occupational Safety and Health..."Criteria for a Recommended Standard."

(2) OSHA - Occupational Safety and Health Admin. - Legally Enforceable Occupational Health Standards - Time-Weighted Average

(3) ACGIH - American Conference of Government Industrial Hygienists - Threshold Limit Values

(4) L.O.D. - Laboratory Limit of Detection in mg/sample

Table II
Metro Bus Maintenance Shop
Washington, D.C.
January 22-23, 1981

Compound Sampled	Sampling Media	Flow Rate (LPM)[1]	Analytical Method	Analytical Method Reference*
Chromium (VI)	AA Filter	1.5		P&CAM 169
Copper, Iron, Lead Nickel, Manganese, Cadmium Vanadium, Chromium (III)	AA Filter	1.5	Atomic Adsorption Spectrophotometer	P&CAM 173
Dioxane, 1,1,1-trichloroethane Trichloroethlyene, Carbon Tetrachloride, Benzene, Xylene, Toluene, Dichloro-benzene, Perchloroethylene	Activated Charcoal	0.2	Gas Chromatography w/Flame Ionization Detector (GC/FID)	P&CAM 127
Ozone	Impinger	1.0		P&CAM 154
Fluoride	Filter	1.5	Specific Electrode	P & CAM 117
Carbon Disulfide	Activated Charcoal	0.2	GC w/Flame Photometric Detector	S-248
Dichloroethyl Ether	Activated Charcoal	0.2	GC/FID	S-357
Hydrazine	Solid Sorbent	0.2	GC/FID	P & CAM 248
Methylene Chloride	Activated Charcoal	0.2	GC/FID	S-329
Methanol	Silica Gel	0.2	GC/FID	S-59
2-nitropropane	Chromasorb-B	0.2	GC/FID	P & CAM 272
Carbon Monoxide	Air Collection Bag	0.5	Direct Reading Ecolyzer	----

* NIOSH Manual of Analytical Methods, Vol. I-VI

(1) (LPM) - Flow rate in liters per minute

Table III

Air Sampling Results for Soldering
METRO Bus Maintenance Shop
Washington, D.C.
January 22-23, 1981

Sample Type	Sample Volume (Liters)	Sample Time	Results (mg/M^3)* Iron	Lead	Manganese	Nickel	Cadmium	Vanadium	Chromium III	Copper	Hydrazine
Personal	685	0802-1541	0.02	ND[1]	ND	ND	ND	ND	ND	0.03	--
Area	690	0827-1608	0.02	ND	ND	ND	ND	ND	ND	0.02	--
Area	85	1323-1420	0.06	ND	ND	ND	ND	ND	ND	ND	--
Area	416	0912-1608	--	--	--	--	--	--	--	--	ND
Area	416	0912-1608	--	--	--	--	--	--	--	--	ND
Area	416	0912-1608	--	--	--	--	--	--	--	--	ND
		L.O.D.[2]	0.005	0.003	0.002	0.003	0.001	0.015	0.005	0.002	0.01
Environmental Criteria		NIOSH	--	0.05	--	0.015	0.04	0.05	--	--	--
		OSHA	10	0.05	5.0	1.0	0.1	0.1	--	0.1	1.3
		ACGIH	5.0	0.15	1.0	1.0	0.05	0.5	0.05	0.2	0.13

* - Approximate milligrams of substance per cubic meter of air
(1) - ND - Non detectable - below the limits of detection (L.O.D.)
(2) - L.O.D. - laboratory limits of detection in milligrams per sample
-- - No analysis performed for this substance on this sample

Table V

Air Sampling Results for Painters
METRO Bus Maintenance Shop
Washington, D.C.

January 22-23, 1981

Sample Type	Sample Volume (Liters)	Sample Time	Results (mg/M^3)* Methylene Chloride	Methanol	2-nitro-propane	Toluene	Benzene	Xylene	Dichloro-benzene	Perchloro-ethylene	1,1,1-Tri-chloroethane	Chromium (VI)
Personal (P)	3.89	1110-1150	ND[1]	--	--	--	--	--	--	--	--	ND
P	3.89	1330-1420	ND	--	--	--	--	--	--	--	--	ND
P	6.57	1110-1150	--	ND	--	--	--	--	--	--	--	ND
P	6.64	1110-1150	--	ND	--	--	--	--	--	--	--	ND
P	4.36	1330-1420	--	ND	--	--	--	--	--	--	--	ND
Area (A)	409.	0936-1625	--	--	--	6.36	0.03	0.32	ND	ND	0.68	ND
A	409	0936-1625	--	--	--	7.33	0.02	0.90	ND	ND	3.91	ND
P	0.63	1330-1420	--	--	ND	--	--	--	--	--	--	ND
A	88	1330-1429	--	--	--	--	--	--	--	--	--	ND
		L.O.D.[2]	0.01	0.01	0.01	0.01	0.003	0.03	0.03	0.05	0.01	ND
Environmental		NIOSH	261	260	--	375	3.2	434	--	339	1910	ND
Criteria		OSHA	1750	260	90	750	3.2	434	450	670	--	ND
		ACGIH	700	260	90	375	3.2	435	450	670	1900	ND

* - Approximate milligrams of substance per cubic meter of air
(1) - ND - Non-detectable - below the limits of detection (L.O.D.)
(2) - L.O.D. - laboratory limits of detection in milligrams persample
-- - No analysis performed for this substance on this sample

Table IV
Metro Bus Maintenance Shop
Washington, D.C.
January 22-23, 1981

Sample Type	Sample Volume (Liters)	Sample Time	Results (mg/M^3)* Iron	Lead	Manganese	Nickel	Cadmium	Vanadium	Chromium (III)	Copper	Ozone	Fluorides
Personal	690	0758-1539	0.02	ND[1]	0.01	ND	ND	ND	ND	0.01	--	--
Personal	695	0758-1543	0.10	ND	0.01	0.017	0.001	ND	0.01	0.01	--	--
Area (A)	710	0815-1610	0.01	ND	ND	ND	ND	ND	ND	ND	--	--
A	434	0847-1601	--	--	--	--	--	--	--	--	0.01	--
A	436	0848-1605	--	--	--	--	--	--	--	--	0.01	--
A	429	0850-1559	--	--	--	--	--	--	--	--	0.01	--
A	690	0835-1615	--	--	--	--	--	--	--	--	--	ND
A	690	0837-1617	--	--	--	--	--	--	--	--	--	ND
	690	0835-1615	--	--	--	--	--	--	--	--	--	ND
		L.O.D.								0.002	0.002	0.003
Environmental		NIOSH	--	0.05	--	0.015	0.04	0.05	--	--	--	2.5
Criteria		OSHA	10	0.05	5.0	1.0	0.1	0.1	--	0.1	0.2	2.5
		ACGIH	5.0	0.15	1.0	1.0	0.05	0.5	0.05	0.2	0.2	2.5

* - Approximate milligrams of substance per cubic meter of air
(1) - ND - Non-detectable - below the limits of detection (L.O.D.)
(2) - L.O.D. - Laboratory limits of detection in milligrams per sample
-- - No analysis performed for this substance on this sample

Table VI

Air Sampling Results for Degreasers
METRO Bus Maintenance Shop
Washington, D.C.
January 22-23, 1981

Sample Type	Sample Volume (Liters)	Sample Time	Results (mg/M^3) Dioxane	1,1,1-tri-chloroethane	Trichloro-ethylene	Carbon Tetra-chloride	Carbon Disulfide	Dichloro-ethyl Ether	Methylene Chloride
Area (A)	5.32	0935-1000	ND[1]	41.4	ND	3.8	--	--	--
A	5.07	0935-1000	ND	33.5	ND	ND	--	--	--
A	11.27	1035-1125	ND	33.7	8.9	0.89	--	--	--
A	6.34	0935-1005	--	--	--	--	ND	--	--
A	7.07	0950-1035	--	--	--	--	ND	--	--
A	11.62	1035-1125	--	--	--	--	ND	--	--
A	6.81	0950-1035	--	--	--	--	--	ND	--
A	3.30	0950-1010	--	--	--	--	--	ND	--
A	6.45	0935-1005	--	--	--	--	--	--	ND
A	3.55	0950-1010	--	--	--	--	--	--	ND
		L.O.D.	0.2	0.01	0.01	0.01	0.002	0.01	0.01
Environmental		NIOSH	3.6	1910	134	13	3.0	--	261
Criteria		OSHA	360	--	535	65	60	90	1750
		ACGIH	180	1900	535	65	30	30	700

* - Approximate milligrams of substance per cubic meter of air
(1) - ND - Non-detectable - below the limits of detection (L.O.D.)
(2) - L.O.D. - Laboratory limits of detection in milligrams per sample
-- - No analysis performed for this substance on this sample