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 75-30-266
STEIGER TRACTOR, INC.
FARGO, NORTH DAKOTA

MARCH 1976

I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) on May 21-22, July 29-30, and October 29-30, 1975, at Steiger Tractor, Inc., in Fargo, North Dakota. At the time of this evaluation, breathing zone and general room samples were taken for xylene, aromatic naphtha, isopropyl alcohol, oil mist, trichloroethane, molybdenum, iron oxide, chromium, manganese, toluene, fluoride, trichloroethylene, total dust, and lead. Potential health hazards from exposure to iron oxide and from combined exposures to isopropyl alcohol plus aromatic naphtha and xylene plus aromatic naphtha were judged to exist based upon excessive airborne concentrations measured for these substances. In addition analyses of the confidential employee interview forms revealed a number of workers with a history of respiratory complaints compatible with over exposure to welding fumes.

II. DISTRIBUTION AND AVAILABILITY

Copies of this hazard evaluation determination report are available upon request from the Hazard Evaluation Services Branch, NIOSH, U.S. Post Office Building, Room 508, Fifth and Walnut Streets, Cincinnati, Ohio 45202. Copies have been sent to:

(a) Steiger Tractor, Inc.
(b) U.S. Department of Labor - Region VIII
(c) NIOSH - Region VIII

This report shall be posted in a prominent place accessible to the workers for a period of approximately thirty days.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by 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 National Institute for Occupational Safety and Health received such a request from the Safety Director of Steiger Tractor, Inc., Fargo, North Dakota, to evaluate potential exposures to xylene, aromatic naphtha, isopropyl alcohol, oil mist, trichloroethane, molybdenum, iron oxide fumes, chromium, manganese, trichloroethylene, fluoride, toluene, total dust, and lead during the manufacturing and assembling of large farm tractors.

IV. HEALTH HAZARD EVALUATION

A. Plant Process

This plant manufactures approximately twenty large farm tractors per day. Many parts of the tractor are purchased from other vendors such as engines, transmissions, rear ends, and so forth. The tractor cabs and frames are made in the plant. This process requires a lot of cutting and welding of iron. After the cabs and frames are made, they are then painted and proceed down the assembly line. Major areas of concern during this evaluation included welding and cutting operations and paint stations and paint booths.

B. Evaluation Design

There are approximately 700 workers in the specific areas of this request. At the time of this evaluation, this plant had only been in operation for one month. Both general room and breathing zone samples were taken in all areas on welders, painters, assembly line workers, and machinists.

C. Evaluation Methods

All metal samples were taken on filters and analyzed by atomic absorption spectroscopy. Solvent samples were taken on charcoal tubes and analyzed by gas chromatography.

D. Criteria for Assessing Workroom Concentrations of Air Contaminants

The two sources of criteria used to assess workroom concentrations of air contaminants in this evaluation are: (1) Recommended and proposed threshold limit value (TLV) and supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH) (1975); and (2) occupational health standard as promulgated by the U.S. Department of Labor (Federal Register, June 27, 1974, Title 29, Chapter XVII, Subpart G).

Substance	Permissible Exposure 8-Hour Time-Weighted Exposure Basis
[1]Xylene	435 mg/M^3
[1]Aromatic naphtha	400 "
[1]Isopropyl alcohol	980 "
[1]Oil mist	5 "
[1]Trichloroethane	1900 "
[1]Molybdenum	5 "
[2]Iron oxide	10 "
[1]Chromium	0.5 "
[1]Manganese	"C" 5 "
[2]Trichloroethylene	535 "
[1]Fluoride	2.5 "
[1]Toluene	375 "
[2]Total dust	10 "
[2]Lead	0.15 "

mg/M^3 = approximate milligrams of substance per cubic meter of air

"C" = Ceiling concentration and should never be exceeded

[1]Reference: 1975 ACGIH TLV and the current OSHA standard

[2]Reference: 1975 ACGIH TLV

Occupational health standards are established at levels designed to protect individuals occupationally exposed to individual toxic substances on an 8-hour per day, 40-hour per week basis over a normal working lifetime.

E. Environmental Results and Discussion

Results of environmental sampling show that one out of thirty-seven of the samples analyzed for iron oxide was over the most recent hygienic standard. However, the combined effect of the iron oxide and manganese showed concentrations approaching the most recent hygienic standards. The combined concentrations of isopropyl alcohol plus aromatic naphtha and xylene plus aromatic naphtha exceeded the most recent hygienic standards in three out of seventeen samples. For a detailed description of all environmental samples, please refer to Tables I through IX.

F. Medical Results and Discussion

A review of medical questionnaires showed a number of welders with a history of respiratory complaints such as chest pain and coughing. These complaints are compatible with those usually associated with over exposure to welding fumes.

G. Conclusions

Results of environmental and medical data illustrate that workers were exposed to excessive levels of iron oxide and combined exposures to isopropyl alcohol plus aromatic naphtha and xylene plus aromatic naphtha. Even though only one sample out of thirty-seven was over the most recent hygienic standard for iron oxide, it is the opinion of the Industrial Hygienist that this is still a major problem because some of this might have been iron oxide fume with a much lower hygienic standard.

H. Recommendations

1. Correction of already existing ventilation systems should be performed on all welding stations.

2. Education of the welders on the proper maintenance of the ventilation system should be initiated.

V. AUTHORSHIP AND ACKNOWLEDGMENT

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TABLE I

ATMOSPHERIC CONCENTRATIONS OF MANGANESE, MOLYBDENUM, IRON OXIDE (Fe_2O_3), CHROMIUM, AND IRON OXIDE PLUS MANGANESE

July 29, 1975

Sample Number	Location	Time of Sample (min.)	Manganese (mg/M^3)	Molybdenum (mg/M^3)	Iron Oxide (Fe_2O_3) (mg/M^3)	Chromium (mg/M^3)	Iron Oxide Plus Manganese (mg/M^3)	Type of Sample
1	Tractor Cab	213	0.2	*	1.7	*		WBZ
2	Tractor Cab	205	0.2	*	2.0	*		WBZ
3	Tractor Frame	204	1.2	*	5.3	*	0.77	WBZ
4	Tractor Frame	201	1.6	*	3.7	*		WBZ
5	Tractor Frame	205	0.3	*	1.5	*		WBZ
6	Tractor Cab	476	0.1	*	0.7	*		General Room
7	Small Parts	192	0.5	*	3.0	*		WBZ
8	Small Parts	202	0.1	*	0.2	*		WBZ
9	Tractor Frame	201	0.8	*	2.4	*		WBZ
10	Tractor Cab	210	0.2	*	1.5	*		WBZ
11	Tractor Cab	160	0.2	*	2.0	*		WBZ
12	Tractor Rear Ends	211	0.5	*	1.7	*		WBZ
13	Tractor Rear Ends	158	0.3	*	2.4	*		WBZ
14	Tractor Cab	160	0.5	*	1.7	*		WBZ
15	Tractor Frame	197	1.2	*	3.6	*		WBZ
16	Tractor Frame	207	2.3	*	4.5	*	0.91	WBZ
17	Small Parts	215	0.3	0.03	2.1	*		WBZ
18	Tractor Cab	214	0.9	*	6.8	*	0.86	WBZ
19	Small Parts	173	0.4	*	2.0	*		WBZ
20	Tractor Wheels	151	0.2	*	2.3	*		WBZ
21	Tractor Wheels	149	1.3	0.05	2.7	*		WBZ
22	Submerged Arc Wheel Welds	142	*	*	0.1	*		WBZ
23	Submerged Arc Wheel Welds	148	0.2	0.04	2.2	*		WBZ
24	Wheel Welder	152	1.0	*	3.7	*		WBZ
25	Wheel Welder	60	*	0.1	0.2	*		WBZ
26	Wheel Welder	144	*	*	*	*		WBZ
27	Wheel Welder	152	4.7	*	14.2	*	2.5	WBZ
28	Wheel Welder	151	1.4	*	6.0	*	0.88	WBZ
29	Wheel Welder	155	0.6	*	2.0	*		WBZ
	HYGIENIC STANDARDS	"C"	5.0	5.0	10.0	0.5	1.0	
	* Limits of Detection		10.0 µg	9.0 µg	10.0 µg	10.0 µg		

WBZ = Welder's Breathing Zone

"C" = Ceiling concentration and should never be exceeded

TABLE II

ATMOSPHERIC CONCENTRATIONS OF ISOPROPYL ALCOHOL, XYLENE, AROMATIC NAPHTHA, ISOPROPYL ALCOHOL PLUS AROMATIC NAPHTHA, AND XYLENE PLUS AROMATIC NAPHTHA

May 22, 1975

Sample Number	Location	Time of Sample (min.)	Isopropyl Alcohol (mg/M^3)	Xylene (mg/M^3)	Aromatic Naphtha (mg/M^3)	Isopropyl Alcohol Plus Aromatic Naphtha (mg/M^3)	Xylene Plus Aromatic Naphtha (mg/M^3)	Type of Sample
1	Undercoating	140	60.0	60.0	70.0			PBZ
2	Special Assembly	164	30.0	300.0	260.0		1.34	PBZ
3	Special Assembly	164	*	10.0	160.0			PBZ
7	Small Parts	180	*	50.0	70.0			PBZ
8	Small Parts	124	*	50.0	180.0			PBZ
9	Frame Painting	140	10.0	90.0	100.0			PBZ
10	Frame Painting	220	*	20.0	130.0			PBZ
11	Frame Painting	200	*	200.0	30.0			PBZ
12	Frame Painting	180	*	40.0	150.0			PBZ
13	Small Parts	182	*	37.0	*			PBZ
14	Finish Area	184	24.0	211.0	357.0		1.4	PBZ
15	Finish Area	182	55.0	53.0	89.0			PBZ
17	Spray Booth	255	*	13.0	33.0			PBZ
18	Small Assembly	240	654.0	*	191.0	1.15		PBZ
19	Small Assembly	248	55.0	68.0	150.0			PBZ
20	Repair	241	*	3.0	92.0			PBZ
21	Repair	361	12.0	163.0	177.0		0.81	PBZ
	HYGIENIC STANDARDS		980.0	435.0	400.0	1.0	1.0	
	* Limits of Detection		0.01 mg	0.01 mg	0.10 mg			

PBZ = Painter's Breathing Zone

TABLE III

ATMOSPHERIC CONCENTRATIONS OF XYLENE, AROMATIC NAPHTHA, ISOPROPYL ALCOHOL, AND TRICHLOROETHYLENE

July 29, 1975

Sample Number	Location	Time of Sample (min.)	Atmospheric Concentrations Xylene	Aromatic Naphtha	Isopropyl Alcohol (mg/M^3)	Trichloroethylene	Type of Sample
4	Painting Booth	200	30.0	*	*	*	PBZ
2	Painting Booth	210	*	47.0	473.0	*	PBZ
3	Tractor Cab	220	*	*	134.0	*	PBZ
1	Tractor Cab	240	*	13.0	484.0	*	PBZ
2966	Tractor Cab	220	6.0	*	384.0	*	PBZ
2972	Tractor Cab	220	5.0	*	433.0	*	PBZ
2971	Tractor Cab	225	*	*	33.0	*	General Room
2976	Tractor Cab	225	9.0	82.0	697.0	*	PBZ
	HYGIENIC STANDARDS		435.0	400.0	980.0	535.0	
	* Limits of Detection		0.01 mg	0.10 mg	0.01 mg	0.01 mg	

PBZ = Painter's Breathing Zone

TABLE IV

ATMOSPHERIC CONCENTRATIONS OF TOTAL DUST

May 21, 1975

Sample Number	Location	Time of Sample (min.)	Atmospheric Concentration Total Dust (mg/M^3)	Type of Sample
1	Wheel Grinding	162	22.0	GBZ
2	Wheel Grinding	155	30.0	GBZ
3	Wheel Grinding	164	4.0	GBZ
5	Wheel Grinding	388	1.0	GBZ
6	Wheel Grinding	387	1.0	GBZ
	HYGIENIC STANDARD		10.0	

GBZ = Grinder's Breathing Zone

TABLE V

ATMOSPHERIC CONCENTRATIONS OF OIL MIST

May 21, 1975

Sample Number	Location	Time of Sample (min.)	Atmospheric Concentration Oil Mist (mg/M^3)	Type of Sample
366	Lathe Operator	385	0.24	LOBZ
371	Lathe Operator	273	0.22	LOBZ
	HYGIENIC STANDARD		5.0	

LOBZ - Lathe Operator's Breathing Zone

TABLE VI

ATMOSPHERIC CONCENTRATIONS OF 1, 1, 1-TRICHLOROETHANE

May 22, 1975

Sample Number	Location	Time of Sample (min.)	Atmospheric Concentration 1, 1, 1-Trichloroethane (mg/M^3)	Type of Sample
16	Cab Insulation	175	351.0	SBZ
4	Cab Insulation	180	223.0	SBZ
5	Cab Insulation	177	1638.0	SBZ
6	Cab Insulation	70	2.0	General Room
	HYGIENIC STANDARD		1900.0	

SBZ - Sprayer's Breathing Zone

TABLE VII

ATMOSPHERIC CONCENTRATIONS OF FLUORIDE

October 29, 1975

Sample Number	Location	Time of Sample (min.)	Atmospheric Concentrations Fluoride (mg/M^3)	Type Sample
1	Tractor Cab	235	0.04	WBZ
2	Tractor Cab	273	0.04	WBZ
	HYGIENIC STANDARD		2.5	
	LIMIT OF DETECTION		0.002	

WBZ = Welder's Breathing Zone

TABLE VIII

ATMOSPHERIC CONCENTRATIONS OF XYLENE, TOLUENE, AND ISOPROPYL ALCOHOL

October 30, 1975

Sample Number	Location	Time of Sample (min.)	Atmospheric Concentrations Xylene (mg/M^3)	Toluene (mg/M^3)	Isopropyl Alcohol (mg/M^3)	Type Sample
2965	Paint Booth	270	12	*	162	General Room
2957	Paint Booth	150	81	11	16	OBZ
2964	Paint Booth	155	182	16	25	OBZ
2960	Paint Booth	270	8	3	835	OBZ
2959	Paint Booth	255	23	1	5	OBZ
	HYGIENIC STANDARDS		435	375	980	
	*LIMIT OF DETECTION		0.01	0.01	0.01	

OBZ = Operator's Breathing Zone

TABLE IX

ATMOSPHERIC CONCENTRATIONS OF LEAD AND IRON OXIDE (Fe_2O_3)

October 30, 1975

Sample Number	Location	Time of Sample (min.)	Atmospheric Concentrations Lead (mg/M^3)	Iron Oxide (mg/M^3)	Type Sample
3	Tractor Cab	273	0.01	34	WBZ
4	Tractor Cab	282	0.01	2	WBZ
6	Tractor Cab	252	0.03	8	WBZ
7	Tractor Cab	283	0.01	3	WBZ
8	Tractor Cab	278	0.01	8	WBZ
9	Tractor Cab	275	*	4	WBZ
5	Tractor Cab	288	0.01	3	WBZ
	HYGIENIC STANDARDS		0.15	10.0	
	*LIMIT OF DETECTION		0.003	0.01	

WBZ = Welder's Breathing Zone