FILE COPY

HEALTH HAZARD EVALUATION REPORT 72-80-130
HAZARD EVALUATION SERVICES BRANCH
DIVISION OF TECHNICAL SERVICES

Establishment	:	Owens-Illinois Glass Company Hapeville, Georgia
Report Prepared By	:	Harry L. Markel, Jr., Industrial Hygienist, NIOSH Region VI, Dallas, Texas James B. Lucas, M. D. Medical Services Branch, NIOSH Cincinnati, Ohio
Field Evaluation	:	Harry L. Markel, Jr. Patrick Murphy James B. Lucas, M. D.
Laboratory Analyses	:	R. H. Hendricks, Ph.D. Floyd Madsen, Chemist Edward Zinowski, Chemist
Originating Office	:	Jerome P. Flesch, Chief Hazard Evaluation Services Branch Cincinnati, Ohio

April 1974

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

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

HEALTH HAZARD EVALUATION REPORT 72-80-130
OWENS-ILLINOIS GLASS COMPANY
HAPEVILLE, GEORGIA

April 1974

I. SUMMARY DETERMINATION

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 the receipt of a written request from any employee or authorized representative of employees, to determine whether any substance 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 employees regarding exposures to hydrogen chloride, sulfur dioxide and tin tetrachloride at the Owens-Illinois Glass Company plant in Hapeville, Georgia.

A NIOSH investigator conducted an observational survey of the associated operation on November 30, 1972. Based on information obtained at that time, it was concluded that environmental/medical evaluations should be made of employee exposures to hydrogen chloride, sulfur dioxide (pre-annealing operations) and tin tetrachloride in the forming and selecting departments.

During the follow-up environmental/medical evaluation, conducted on June 13-14, 1973, twenty-eight (28) personal and twenty-one (21) general area air samples were collected to obtain appropriate analytical determinations for hydrogen chloride, sulfur dioxide and tin tetrachloride. The associated health standards, as promulgated by the U. S. Department of Labor (Federal Register, Part II, 1910.93, Table G-1) were not exceeded in any instance for either the 8-hour time-weighted average or ceiling concentration applications.

Thirty (30) male employees from the Forming Department were privately interviewed in a non-directive manner to elicit any symptoms or medical problems of sufficient magnitude to come spontaneously to mind. In several instances, a brief eye, nose and throat (ENT) examination was performed. Prior to concluding the previously-mentioned interview, each worker was questioned about various other job-related conditions, to insure that possible significant pathology was not being overlooked.

Based on the results of the environmental/medical study reported above, it was determined that, under conditions found at the time of the survey, concentrations of hydrogen chloride, sulfur dioxide (pre-annealing operations) and tin tetrachloride were not toxic, and did not constitute a hazard to the health of the workers in the Forming and Selecting Departments(s).

Minor toxicity, manifested by temporary eye irritation (tearing, burning, etc.), was, however, found to exist in approximately one-third of the employees interviewed as a result of sulfur dioxide generated when raw sulfur is applied, as a lubricant, to the hot bottle machine molds. This application is intermittent, and of 1-2 minutes duration. Such short-term "peak" concentrations of SO_2 were not able to be quantitated nor identified via the results obtained by collection of long-term samples of 1-3 hour duration.

A significant number of employees also sporadically developed a mechanical dermatitis from airborne powdered glass dust resulting from the breaking of imperfectly manufactured bottles. Appropriate recommendations were made to management for corrective action in each instance. No other definite occupational health problems were discerned during the course of this survey.

Copies of this Summary Determination, as well as the full report of the evaluation, are available, upon request, from the Hazard Evaluation Services Branch, NIOSH, U. S. Post Office Building, Room 508, 5th and Walnut Streets, Cincinnati, Ohio 45202. Copies of both have been sent to:

a) Owens-Illinois Glass Company, Hapeville, Georgia
b) Authorized Representative of Employees
c) U. S. Department of Labor - Region IV
d) National Institute for Occupational Safety and Health, Region IV

For purposes of informing "affected employees", the employer will promptly "post" the Summary Determination in a prominent place(s), near where affected employees work, for a period of thirty (30) calendar days.

II. 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 (NIOSH) received such a request from an authorized representative of employees of the Owens-Illinois Glass Company, Hapeville, Georgia.

The alleged hazard concerns irritant symptoms experienced by workman in the glass bottle forming department and adjacent sections of the plant.. Substances utilized included sulfur dioxide, tin tetrachloride, sulfur, and various mold lubricants or "dopes" which principally contain graphite suspended in various petroleum oils, sulfurized fatty oils, wetting agents, soap thickeners and waxes. Approximately fifty (50) persons per shift are "exposed".

Although not specifically mentioned on the original request for Health Hazard Evaluation, consideration was also given to employee exposure(s) to: (1) environmental heat; (2) noise and (3) hydrochloric acid (potential hazard as tin tetrachloride is exposed to moisture). Noise and heat will be discussed only briefly in other sections of this report.

III. BACKGROUND HAZARD INFORMATION

A. Standards

The Occupational Health Standards, as promulgated by the U.S. Department of Labor (Title 29, Code of Federal Regulations, Chapter XVII, Part 1910, Subpart G, § 1910.93, entitled Air Contaminants), applicable to substances of this evaluation are as follows:

Substance	Standard	
	8-hour time-weighted average	Acceptable ceiling concentration
Hydrochloric acid (hydrogen chloride)	--	7 mg/M^3*
Sulfur dioxide	13 mg/M^3*	--
Tin Tetrachloride (as inorganic tin)	2 mg/M^3*	--

*mg/M^3 = milligrams of substance per cubic meter of air sampled.

B. Toxic Effects

Aqueous solutions of hydrogen chloride have a wide variety of industrial uses. Atmospheric contamination also occurs as the result of many chemical reactions which generate this substance. Intoxication from inhalation is rare, since it is highly irritant in low concentrations, and prolonged exposure is intolerable. If accidentally inhaled in high concentrations, necrosis of the tracheal and bronchial epithelium occurs, resembling thermal burns. Prolonged exposure to low concentrations causes erosion of the teeth, bleeding of the nose and gums, ulceration of the nasal and oral mucosa, and skin tenderness. This chemical is also well known as an eye irritant. A TLV of 5 parts per million is suggested, and levels of 1-5 parts per million are detectable by most individuals.

Sulfur dioxide is a gas known to cause irritation to the mucuous membranes of the nose and throat at levels exceeding 6 parts per million. However, 0.3 parts per million can be detected by most individuals, and 3 parts per million is easily detected -- thus providing a considerable margin for safety. Eye irritation is noted at approximately 20 parts per million. At very high levels, pulmonary and laryngeal edema may occur with respiratory paralysis. Chronic exposures may result in fatigue, prolonged upper respiratory tract infections, alterations in the senses of taste and smell, and inflammation of upper air passage linings.

In contrast to the organic tin compounds which are highly toxic, inorganic tin salts are relatively innocuous. Since most inorganic tin salts are acid in reaction, they have irritative properties, which make exact evaluations of toxicity difficult. Some inorganic tin salts apparently cause paralysis and other neurologic damage in some animal species following subcutaneous injection(s). Tin tetrachloride itself is caustic and highly irritating to the mucuous membranes. These irritating properties are probably sufficient to prevent serious overexposure.

IV. HEALTH HAZARD EVALUATION

A. Initial Visit - Observational Survey

The initial observational survey of the Owens-Illinois Glass Company, Hapeville, Georgia, was performed on November 30, 1972, by NIOSH representative, Mr. Harry L. Markel, Jr.

The function of the National Institute for Occupational Safety and Health, its relation to Section 20(a)(6) of the Occupational Safety and Health Act of 1970, and the purpose of the visit were explained to the Plant Manager, Corporate Industrial Hygienist, Director of Safety, and Plant Engineer. The National Surveillance Network Questionnaire, Part I, was completed with their assistance.

The plant manufactures glass containers, currently employs some one thousand production workers, and is unionized by the: (1) Glass Bottle Blowers Association, Local Numbers 63 and 101; (2) American Flint Glass Workers Union, Local Number 6; and (3) Teamsters Union, Local Number 528.

The President of the Glass Bottle Blowers Association, Local Number 101, and the Plant Engineer participated in the plant walk-thru survey which followed the above-mentioned conference.

Molten cylindrical ingots of glass (2200°F) are gravity-fed into forming machine molds and blown into shape by compressed air. A total of thirteen (13) bottle machines (Section A, 6 machines; Section B, 5 machines; Section C, 2 machines) are operated within the Forming Department. Operators work in close proximity to the forming machines, making adjustments, rejecting imperfectly formed bottles, and applying "dope" to the molds. "Doping" is required to maintain a constant mold temperature which is necessary to prevent the formation of flaws (checking) in the glass.

Graphite-based "dopes" are usually applied 3-4 times hourly, but considerable variation in frequency was observed, depending upon the individual operator and the product line being manufactured. Some operators utilize raw sulfur, especially when the graphite-based products do not produce the desired end result. Subsequent to forming, annealing takes place by passing the bottles through 1200°F gas-fired ovens. Each oven is located approximately 30-40 feet from the corresponding forming machine, and normally is a fully automated process not requiring an operator.

Depending upon the product line, a pre-annealing treatment may be applied. Sulfur dioxide (SO_2) is added to bottles intended for ultimate use with parenternal fluids. This "hardens" the interior surface and prevents the contained fluid from leaching sodium and other ions from the glass. Thus, two (2) sources of atmospheric contamination with sulfur dioxide were found to exist in the workplace, namely, (a) "doping" hot molds with sulfur and (b) the compressed sulfur dioxide utilized in pre-annealing operations.

On other product lines, primarily returnable beer and soft drink bottles, the exterior surface is coated with a gaseous dispersion of fuming tin tetrachloride (anhydrous stannic chloride). This provides a tough glass surface much less likely to adhere to, or scratch, when touching another bottle. Both substances are applied under hood ventilation immediately prior to annealing. Following annealing, the finished bottles leave the Forming Department and are transported, by conveyors, to the Selecting Department, where they are subjected to rigorous inspection procedures. The entire Forming Department is equipped with multiple forced-air ventilation systems supplying the very large volumes of tempered air necessitated by the amount of radiant heat generated by the molten glass.

As no medical officer was present during the observational survey, Mr. Markel conducted private interviews with some nine (9) employees in the Forming Department and four (4) employees in the adjacent Selecting Department, The purpose of these interviews was to obtain a minimal amount of information relating to respiratory/other problems employees assigned to these areas might be experiencing.

Based on conditions found during the observational survey, it was concluded that further medical/environmental evaluation(s) should be forthcoming. To adequately evaluate the work environment, the decision was made to collect appropriate air samples for determination of hydrochloric acid, sulfur dioxide and tin tetrachloride concentrations in the atmosphere.

B. Environmental Evaluation

1. Procedure and Methods

On June 13-14, 1973, a follow-up environmental survey was conducted by NIOSH representatives, Messrs. Harry L. Markel, Jr., and Patrick Murphy, to determine atmospheric levels of hydrochloric acid, sulfur dioxide and tin tetrachloride within the Forming/Selecting Departments.

Ten (10) personal and four (4) general area samples were collected for detection of hydrogen chloride, as were four (4) personal and six (6) general area samples for evaluation of sulfur dioxide concentrations. Similarly, fourteen (14) personal samples and eleven (11) general area samples were collected to assist in the analyses for the presence of tin tetrachloride.

Hydrogen chloride samples were collected by using an MSA, Model G, battery-operated vacuum pump, at flow rates of 1.7 liters per minute, with midget impingers containing ten (10) milliliters of 0.01 N sodium hydroxide as the absorbing solution. Chloride concentrations were determined turbidimetrically with silver nitrate. The sensitivity of the analytical method is 0.02 milligrams of hydrochloric acid, or 0.1 mg HCl/M^3, assuming at least a 200 liter air sample.

Sulfur dioxide samples were collected by using an MSA, Model G, battery-operated vacuum pump, at flow rates of 1.7 liters per minute, with midget impingers containing ten (10) milliliters of 0.3 N hydrogen peroxide as the absorbing solution. The sulfur dioxide was oxidized to SO^4 in the hydrogen peroxide solution and titrated with barium perchlorate in an 80% alcohol solution. The sensitivity of the analytical method is 0.01 milligrams of sulfur dioxide or 0.05 mg SO_2/M^3, assuming at least a 200 liter air sample.

All tin tetrachloride samples were collected by using an MSA, Model G, battery-operated vacuum pump, at flow rates of 1.7 liters per minute, with type HA, unweighed, 37 millimeter cellulose membrane filters. The samples were analyzed for tin by atomic absorption spectroscopy. The detection limit of the analytical method is 50 micrograms of tin per sample.

Numerous noise measurements were made during the survey by use of an MSA Permissible Sound Level Meter, Model 1565-B.

2. Results and Discussion

A total of forty-nine (49) air samples were collected during the survey, with appropriate analytical determinations being performed by the NIOSH Western Area Occupational Health Laboratory in Salt Lake City, Utah.

Tables I, II and III show the air concentrations of hydrochloric acid, sulfur dioxide and tin tetrachloride, respectively, for all personal breathing-zone and general area samples collected during the survey.

Table IV shows the minimum, maximum and average air concentrations of said compounds.

Table V shows noise levels as measured at the indicated bottle machines on June 13, 1973. Table VI shows the time-weighted and attenuated exposure based on hearing protection devices currently being worn within the plant.

The established standard for hydrogen chloride (Federal Register, Part II, § 1910.93, Table G-1), as promulgated by the U.S. Department of Labor, is 7 milligrams per cubic meter, expressed as a ceiling value. From Table I, it can be seen that all concentrations were well below said established standard.

The established standard for sulfur dioxide (Federal Register, Part II, § 1910.93, Table G-1), as promulgated by the U.S. Department of Labor, is 13 milligrams per cubic meter, expressed as an 8-hour time-weighted average. Table II reveals that all concentrations were well below the appropriate standard.

The established standard for tin tetrachloride, expressed as inorganic tin (Federal Register, Part II, § 1910.93, Table G-1), as promulgated by the U. S. Department of Labor, is 2 milligrams per cubic meter, expressed as an 8-hour time-weighted average. From Table III, it can be seen that all concentrations were well below the established standard.

Based on data contained in Tables V and VI, it appears that the hearing protection currently being furnished to employees is adequate, provided that the following assumptions are made: (1) the devices are worn at all times; (2) the devices are fitted properly; (3) octave-band levels are equal; (4) measured noise levels represent "normal" conditions; and (5) a work schedule approximating that shown on Table VI is followed. These comments, however, are not intended to exclude the need for pursuit of engineering measures to control, or reduce, noise generated at the source(s).

C. Medical Evaluation

1. Procedure and Methods

Thirty (30) male employees from the Forming Department were privately interviewed. All were currently working the first or second shifts, and were judged to be suitable representatives because the work is continuous and identical on all shifts. Each interview was begun in a non-directive manner to elicit any symptoms or medical problems of sufficient magnitude to come spontaneously to mind.

Data relative to specific machines, area of work, job description, age, employment history, and smoking habits were also obtained. When this portion of the interview was completed, each employee was specifically asked about the following signs and symptoms: cough, shortness of breath, sore throat, changes in the senses of taste or smell, eye irritation (burning, redness, tearing), fatigue, tooth discoloration and erosion, nasal discharge, muscle cramps and dermatitis. In several instances, a brief eye, nose and throat (ENT) examination was performed. Before concluding the interview, each man was questioned about co-workers, men on other shifts, men on disability, and recently deceased workers, to insure that possible significant pathology was not being overlooked.

2. Discussion and Results

As might be anticipated, a variety of past and present medical problems were elicited, including labyrinthitis, epistaxis, frequent colds, hypertension, duodenal ulcer, bursitis, rhinophyma, sinusitis and pneumonia. These were judged to be non-occupational in origin and not excessive in number. Two (2) individuals with emphysema were encountered, both having histories of heavy smoking. Four (4) men complained of hearing loss, and two (2) of these were noted to have some loss of conversational level hearing.

Only two (2) types of symptoms were being experienced by fairly large numbers of individuals. Ten (10) men complained of eye irritation when exposed to fumes produced from treating molds with sulfur or "dope". This irritation was usually of short duration (2-3 minutes) and cleared between mold treatments. One individual used eye drops to relieve this irritation. Other men either seldom use sulfur, claiming it is unnecessary, or have learned to avoid exposure to the burst of fumes produced by its use.

Seven (7) men complained of dermatitis of various types. The majority of these complaints concerned the skin irritation produced by powdered glass -- a problem most commonly encountered during changeovers when initial production runs contain an inordinate number of defective bottles. These bottles are discarded by depositing them into cullet chutes which drop them to the floor beneath. When the bottles break, finely powdered glass dust becomes airborne and is deposited around the cullet opening. When such material settles between clothing and the skin, irritation occurs in a manner analogous to fiberglass dermatitis. This dust, because of its size and lack of free silica content, does not present a pulmonary hazard.

Although no actual heat study was performed during the overall survey, the following comments are offered to assist management in self evaluating a work environment which appeared to present "excessive heat" conditions during the June 13-14 NIOSH survey.

The physical effects of excessive exposure to environmental heat are determined, to a large extent, by factors other than actual temperature. Work load, rest periods, water/salt supplementation, clothing, general physical fitness and acclimatization are all extremely important in determining levels at which effects can be expected to become manifest. In general, well adults, performing continuous moderate work, can easily tolerate a wet black globe temperature of 80°F without developing heat disorders.

Heat fatigue is the mildest of the heat disorders and is characterized by decreased ability to concentrate, tiredness and irritability. Heat prostration (heat collapse, exhaustion, or syncope) results in weakness, dizziness, vertigo, nausea, blurred or dim vision and mild muscular cramps which may progress to a listless, apprehensive semicomatose state. In severe cases, unconsciousness may result because of complete circulatory collapse, even though the body temperature remains normal. The prognosis is excellent and the condition is usually transient.

Heat cramps are sudden, severe muscular cramps resulting from excessive physical exertion in high temperatures. This condition occurs mainly among unacclimated individuals such as stokers, miners and firemen who perform extremely severe physical labor in very hot environments.

The most severe heat disorder is heat hyperpyrexia (sunstroke, heat stroke). In this condition, a profound disturbance of the heat-regulating mechanism occurs following prolonged exposure to excessively high temperatures -- ultimately leading to high fever and collapse. Convulsions, comas and death are not infrequent despite prompt medical attention. This heat disorder is largely a problem of the elderly non-working age population and the severity of the syndrome is usually related to an already compromised physical state due to heart, kidney or other underlying diseases.

A heat survey conducted by the Owens-Illinois Glass Company in August, 1973, revealed wet black globe temperatures ranging from 79°F to 89°F, or slightly in excess of the normally accepted 80°F. It is, therefore suggested that management actively pursue means to reduce existing environmental heat levels within the plant.

D. Conclusions

Based on the results of the environmental/medical study, it was determined that, under conditions found at the time of the survey, concentrations of hydrogen chloride, sulfur dioxide (pre-annealing operations) and tin tetrachloride were not toxic, and did not constitute a hazard to the health of the workers in the Forming and Selecting Department(s).

Minor toxicity, manifested by temporary eye irritation (tearing, burning, etc.), was, however, found to exist in approximately one-third of the employees interviewed as a result of sulfur dioxide generated when raw sulfur is applied, as a lubricant, to the hot bottle machine molds. This application is intermittent, and of 1-2 minutes duration, thus validating results of long term sampling which does not allow for "peak" concentrations, and ultimate brief periods of employee eye irritation.

A significant number of employees also sporadically developed a mechanical dermatitis from airborne powdered glass dust resulting from the breaking of imperfectly manufactured bottles. Appropriate recommendations were made to management for corrective action in each instance. No other definite occupational health problems were discerned during the course of this survey.

V. RECOMMENDATIONS

1. A definite need to utilize sulfur as a mold lubricant and temperature stabilizer was not determined to be essential to the operation. Its use should, therefore, be abandoned in favor of graphite-based substitutes. While the use of sulfur for this purpose is traditional in the glass industry, its present use appears to be more through custom than through necessity.

2. Presently used cullet chutes should be provided with a constant water wash to prevent finely divided glass powder from becoming airborne.

3. The present exhaust ventilation system should be properly maintained at all times. Unnecessary clogging, etc. of ducts is a proven contributor to an overall reduction in collection efficiency.

4. Where sulfur dioxide is emitted, suitable ventilation is mandatory to insure that the quantity present in the work place atmosphere is below acceptable limits. The observed condition of the Lehr from station B-3 exhausting directly into the plant interior should be corrected at the earliest possible date.

5. As has been previously stated, it appears that the hearing protection currently being furnished to employees is adequate, provided that certain assumptions are made (Page 7, Paragraph 3). Current management policy requiring the use of personal protective hearing devices when in "high noise areas" should be enforced with vigor.

TABLE I

(**) Hydrochloric Acid Concentrations
Owens-Illinois Glass Company
Hapeville, Georgia

June 13-14, 1973

Sample No.	Date Sample Collected	(a) Type of Sample	(b) Sampling Location	Sample Volume (Liters)	(c) Concentration (mg/M^3)
13424	6-13-73	P	A-1	213	0.7
13425	6-13-73	P	A-5	213	< 0.3
13426	6-13-73	P	B-1	191	< 0.3
13427	6-13-73	P	B-5	196	< 0.3
13428	6-13-73	P	D-1	179	0.4
13429	6-13-73	P	(*)A-6/A-7	170	< 0.3
13430	6-13-73	GA	(*)A-2/A-4	167	< 0.3
13431	6-13-73	GA	(*)B-3/B-4	133	0.5
13432	6-14-73	P	A-1	223	0.6
13433	6-14-73	P	A-5	224	< 0.3
13434	6-14-73	P	B-1	212	< 0.3
13435	6-14-73	P	B-5	212	< 0.3
13436	6-14-73	P	D-1	208	0.6
13437	6-14-73	GA	(*)A-1/A-7	202	< 0.3

(a) P = Personal; GA = General Area

(b) Sampling Location indicated by number of bottle machine

(c) mg/M^3 = milligrams of substance per cubic meter of air sampled

(*) Samples 13429, 13430, 13431 and 13437 collected on catwalks above appropriately numbered bottle machine.

(**) Hydrogen Chloride

TABLE II

Sulfur Dioxide Concentrations
Owens-Illinois Glass Company
Hapeville, Georgia

June 13-14, 1973

Sample No.	Date Sample Collected	(a) Type of Sample	(b) Sampling Location	Sample Volume (Liters)	(c) Concentration (mg/M^3)
13439	6-13-73	P	B-3	265	0.3
13440	6-13-73	GA	B-3	272	0.4
13441	6-13-73	P	B-4	236	0.8
13442	6-13-73	GA	(*)B-3/B-4	133	1.4
13443	6-13-73	P	B-3	238	0.3
13444	6-13-73	P	B-4	250	0.4
13445	6-13-73	GA	B-3	182	0.4
13446	6-13-73	GA	(*)B-3/B-4	216	0.9
13447	6-14-73	GA	Selecting Dept	230	0.1
13448	6-14-73	GA	Selecting Dept	204	0.1

(a) P = Personal; GA = General Area

(b) Sampling Location indicated by number of bottle machine

(c) mg/M^3 = milligrams of substance per cubic meter of air sampled

(*) Samples 13442 and 13446 collected on catwalks above appropriately numbered bottle machine.

TABLE III

Tin Tetrachloride Concentrations (As Tin)
Owens-Illinois Glass Company
Hapeville, Georgia

June 13-14, 1973

Sample No.	Date Sample Collected	(a) Type of Sample	(b) Sampling Location	Sample Volume (Liters)	(c) Concentration (mg/M^3)
13450	6-13-73	P	A-1	254	< 0.2
13451	6-13-73	P	D-1	234	< 0.2
13452	6-13-73	P	B-1	218	< 0.2
13453	6-13-73	P	D-2	253	< 0.2
13454	6-13-73	P	A-6	264	< 0.2
13455	6-13-73	P	B-5	208	< 0.2
13456	6-13-73	P	A-7	230	< 0.2
13457	6-13-73	P	B-2	202	< 0.2
13458	6-13-73	GA	A-1	179	< 0.3
13459	6-13-73	GA	A-6	290	< 0.2
13460	6-13-73	GA	(*)A-2/A-4	170	< 0.3
13461	6-13-73	GA	B-1	280	< 0.2
13462	6-13-73	GA	(*)A-6/A-7	167	< 0.3
13463	6-13-73	GA	B-5	143	< 0.3
13464	6-13-73	GA	D-1	110	< 0.5
13465	6-13-73	GA	D-2	250	< 0.2
13466	6-13-73	GA	(*)B-3/B-4	131	< 0.4
13467	6-14-73	P	A-6	262	< 0.2
13468	6-14-73	P	B-1	242	< 0.2
13469	6-14-73	P	A-1	298	< 0.2
13470	6-14-73	P	B-5	284	< 0.2
13471	6-14-73	P	D-2	260	< 0.2
13472	6-14-73	P	D-1	228	< 0.2
13473	6-14-73	GA	Selecting Dept	230	< 0.2
13474	6-14-73	GA	Selecting Dept	204	< 0.2

(a) P = Personal; GA = General Area

(b) Sampling Location indicated by number of bottle machine

(c) mg/M^3 = milligrams of substance per cubic meter of air sampled

(*) Samples 13460, 13462 and 13466 collected on catwalk above appropriately numbered bottle machine.

TABLE IV

Summary of Air Sampling Activities
Owens-Illinois Glass Company
Hapeville, Georgia

June 13-14, 1973

	No. of Samples	(a) Concentration Minimum	Average	Maximum	(a) Applicable Standard
I. Hydrochloric Acid (*)					
A. General Area	4	$< 0.3mg/M^3$	$0.4mg/M^3$	$0.5mg/M^3$	$7mg/M^3$
B. Personal	10	$< 0.3mg/M^3$	$0.4mg/M^3$	$0.7mg/M^3$	(ceiling)
II. Sulfur Dioxide					
A. General Area	6	$0.1mg/M^3$	$0.5mg/M^3$	$1.4mg/M^3$	$13mg/M^3$
B. Personal	4	$0.3mg/M^3$	$0.5mg/M^3$	$0.8mg/M^3$	(8-hr. time-weighted average)
III. Tin Tetrachloride					
A. General Area	11	$\leq 0.2mg/M^3$	$0.3mg/M^3$	$< 0.5mg/M^3$	$2mg/M^3$
B. Personal	14	$\leq 0.2mg/M^3$	$0.2mg/M^3$	$\leq 0.2mg/M^3$	(8-hr. time-weighted average)

(a) mg/M^3 = milligrams of substance per cubic meter of air sampled

(*) Hydrogen Chloride

TABLE V

Noise Levels (dBA)-Forming Department
Owens-Illinois Glass Company
Hapeville, Georgia
June 13, 1973

BOTTLE MACHINE NUMBER	Noise Level in dBA			
	FORMING SIDE	BOTTLE EJECTING	FURNACE	WORK BENCH
A-1	109	107	103	105
A-2	115	110	101	106
A-4	110	106	102	101
A-5	113	111	102	102
A-6	110	108	102	105
A-7	110	106	102	105
B-1	113	112	102	105
B-2	110	106	101	101
B-4	108	103	100	100
B-6	107	106	101	101
B-7	110	110	100	100
D-1	112	108	102	102
D-2	111	107	101	101

TABLE VI

Time-Weighted Exposure/Attenuated Exposure
Machine Operators
Owens-Illinois Glass Company
Hapeville, Georgia

June 13, 1973

Machine Number	Time-Weighted Average (dBA)	(a) Attenuated Exposure (dBA) Willson EP-101-B	Clark E-305	Sound Sentry 5000-B
A-1	101	81	81	84
A-2	103	83	83	86
A-4	99	79	79	82
A-5	102	82	82	85
A-6	101	81	81	84
A-7	101	81	81	84
B-1	103	83	83	86
B-2	99	79	79	82
B-4	98	78	78	81
B-6	99	79	79	82
B-7	100	80	80	83
D-1	101	81	81	84
D-2	100	80	80	83

Note: Following distribution assumed for normal 8-hour workday

2.5 hours - Workbench and isleways adjacent to machine
2.0 hours - At machine (forming side)
2.0 hours - At machine (bottle ejection side)
1.0 hour - Break time, etc. (60 dBA)
0.5 hour - In vicinity of annealing oven

(a) For example: Machine A-1, Time-weighted average = 101 dBA
For WILLSON EP-101-B Ear Protectors
Attenuated Exposure = 101dBA - 20.1 dBA ("R" value from sample calculations)
$\simeq$ 81 dBA = acceptable