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

INTERIM REPORT #2
HEALTH HAZARD EVALUATION PROJECT NO. HHE 79-66
SIGNETICS CORPORATION
SUNNYVALE, CALIFORNIA 94086

JANUARY 31, 1980

I. SUMMARY

On March 14, 1979, the National Institute for Occupational Safety and Health (NIOSH) received a request from an authorized employee representative for a health hazard evaluation at Signetics Corporation, Sunnyvale, California. The request alleged that employees working in Research and Development (R&D), Arques Building, and the Office and Management Building were exposed to xylene, polyvinyl chloride, trichloroethylene, benzene, nickel and other metals. Additionally, the employees complained of various symptoms such as irritation to the eyes, throat, mouth, nose, chest, and lightheadedness.

A NIOSH team conducted an industrial hygiene survey of the old and new laboratories of the R&D building. Thirty-three area air samples were collected and analyzed for organics. Trichlorotrifluoroethane, 1,1,1 trichloroethane, methyl chloride, toluene and xylene were identified (see Table I), but at levels well below the NIOSH recommended criteria and the California-Occupational Safety and Health Administration (Cal-OSHA) Standard.

The work-related health complaints, which first came to the attention of these employees in early 1977, fall uniformly into two categories: irritant and narcotic. The irritant symptoms include sore throat, burning nose, burning tongue, perceived "roughening" of the teeth, metallic taste, and chest tightness. Signs consistent with exposure to an airborne irritant include mouth or tongue blisters, nosebleeds, and cough. Symptoms of a narcotic type included headache (frequently severe and lasting for several days), lightheadedness, and a feeling of swelling of the head.

The present investigation consisted entirely of detailed interviews and examination of medical records in connection with five current and three recently terminated Signetics employees, examination of medical and personnel records of ten additional current employees, and review of reports from various Signetics consultants.

The medical investigators (M. Donald Whorton, M.D. and Thomas H. Milby, M.D.) concluded that the problem originally identified in the R&D building in August 1977 continued to the time of their evaluation. They had not previously encountered an occupational health problem similar to that

found at Signetics Corporation. In their opinion the problem was caused by one or more chemical agents in certain areas of the Signetics workplace, which, upon becoming airborne, are capable of irritating the mucous membranes and inducing an altered state of response in some persons. Also, certain symptoms consistently reported by Signetics employees suggested the possibility of intermittent exposure to a narcosis-producing agent. Because of the restrictions placed on the investigation, the true population at risk and the true population affected could not be satisfactorily identified.

The investigators are of the opinion that a significant occupationally-related health problem exists at the Signetics Sunnyvale facility. Accordingly, they recommended that a larger, more systematic study be undertaken in order to (1) fully characterize the present medical problem; (2) determine the number of employees affected; (3) and formulate control procedures.

II. INTRODUCTION AND BACKGROUND

On March 14, 1979, the National Institute for Occupational Safety and Health received a request for a health hazard evaluation from an authorized employee representative.* The request alleged that employees working in the Research and Development building became sensitized to work processes and thus were no longer able to work in the same work area or perform the same job duties.

The NIOSH staff, industrial hygienists Pierre Belanger and Melvin Okawa, performed an initial walk-through survey of Signetics Corporation on April 20, 1979. A similar complaint had been filed with Cal-OSHA; consequently, Cal-OSHA representatives Linda Garb, M.D. and Brian Lovegren accompanied the two NIOSH representatives.** It should be noted that the old R&D area was undergoing major renovation during all visits to the Signetics Plant. None of the rooms were being used with the exception of room 124. This was the only room in which the ventilation system was still intact. Two follow-up environmental surveys were performed on June 14-15 and July 17, 1979.

On July 2, 1979 Environmental Health Associates, Inc. (EHA) was requested, pursuant to NIOSH Contract No. 210-78-0104, Task Order No. 1, to provide professional (physician) services in support of HHE 79-66, Signetics Corporation, Sunnyvale, California.

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*Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 659(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.

**Interim Report No. 1, Project No. HHE 79-66. Signetics Corporation, Sunnyvale, CA.

Historical Account of the Problem

According to the investigators' understanding of the information provided, the first recognizable health problem was brought to the attention of the Signetics management in September 1977 when an employee in the (R&D) area complained of burning tongue, sores in mouth, metallic taste, headaches, tachycardia and chest discomfort.

Within a few days another employee in the same area voiced similar complaints. On October 6, 1977 the Cal-OSHA consultation unit responded to a request by the company to help determine the cause of the employees' problem. Meanwhile, other employees in the R&D building began to note similar complaints. It appears that during this period, the major problem was located on the first floor of the west wing of the R&D building.

On December 14, 1977 the company shut down the west wing of the R&D building for repairs. At this time there were multiple consultations with the County of Santa Clara, Bruce Dickerson, M.D., Environmental Analysis Laboratories, and Environmental Research Company.

A January 6, 1978 report from Environmental Analysis Laboratories, Richmond, California, comprised of sampling results obtained over an extended period of time indicated that concentrations of "anticipated contaminants" were found at a small percentage of the respective threshold limit values (TLV's) except for ozone.* A subsequent report, prepared by Environmental Research Company, St. Paul, Minnesota, dated May 24, 1978, recommended that Signetics implement the following:

> (1) Remove the air return from the penthouse area. This is particularly important regarding the production area return; (2) Immediately replace the activated charcoal in the air conditioner inlets; (3) Establish a test program for determining the useful, effective life of the activated charcoal, i.e., determine replacement interval and implement periodic replacement; (4) Duct all sources of organic vapors to a single control device for the removal of organic and toxic vapors which are currently being emitted into the ambient air.

*In two instances, single samples for ozone detected greater than the TLV concentration of 0.11 ppm. In one case 2.04 ppm was detected in room 120; in another, 0.82 ppm was determined in the glass diffusion area.

On January 13, 1978 the R&D west wing was reopened and the "sensitized persons"--the employees who had registered complaints--were moved elsewhere. Dr. Dickerson's report was submitted to the Company in January 1978. He concluded:

> It appears that there were certain biological reactions from chemical exposures of some employees including sensitivity reactions, reactions to chemicals owing to inadequate ventilation and backdrafts down certain hoods, and in one case a moderately severe reaction caused by the individual placing his head in or very near exhaust vapors exiting from local exhaust hoods in a wafer fabrication area. However, the major problem appears to have been of a viral nature, as evidenced by characteristic symptomology and high lymphocyte counts in 62% of individuals tested.

Dr. Dickerson recommended (1) that employees be informed of study findings; (2) that steps be taken to implement continued ventilation studies and suggested engineering changes, and (3) that lymphocyte counts be repeated.

In a second report by the Environmental Analysis Laboratories, dated July 21, 1978, further recommendations for changes in the ventilation system were made.

On June 8, 1978 a new repair schedule was undertaken. From September to December 1978 there were infrequent employee complaints except for unpleasant odors.

Sometime in June or July 1978 the three employees who appeared to be most sensitive to the "fume problem" were instructed to sit in the cafeteria rather than to report to their usual work place. Except for occasional brief visits to various work areas, they remained there until discharged by the company on or about July 27, 1979.

III. HEALTH HAZARD EVALUATION

A. Environmental Survey

On April 20, 1979 an initial environmental survey was conducted by NIOSH Region IX staff. No environmental air samples were collected during this visit. The purpose of the initial visit was to perform a walk-through survey, obtain a copy of the chemical inventory list, and collect any data that would be useful in planning the follow-up survey.

The requestors, who escorted the investigators through the facility, complained of eye and throat irritation when they approached rooms 114 and 116 of the R&D building. None of the investigators (NIOSH Or Cal-OSHA) experienced a similar reaction. Furthermore, the area known as old R&D laboratories was empty, and in several cases, previously existing walls had been removed. The ventilation system for this area was virtually non-existent except for one lab (room 124).

B. Environmental Air Sampling

Area air sampling was performed during both follow-up surveys (June 14-15 and July 17, 1979), in order to characterize general work area conditions. Air sampling for volatile organics was carried out using a direct reading instrument, charcoal tubes and fluorosil tubes. Area samples, collected from the old R&D laboratories, were placed in the center of the room (when possible) about 3 feet above the floor. Area samples, collected from the R&D basement, were placed near chemical storage cabinets, near exhaust hoods and along the hallway perimeter of the laboratories.

Vacuum pumps were calibrated and used to draw a known volume of air through a collecting medium (i.e., 150 milligram (mg) charcoal tube or fluorosil tube).

A direct reading instrument (Century-organic vapor analyzer (OV) Model #128)* was calibrated and used to monitor organic vapors.

The charcoal tubes were desorbed with carbon disulfide and analyzed by gas chromatography using a 20 foot, SS, 10% SP1000 column. Only very small peaks were detected on any of the samples. The fluorosil tubes were desorbed with ethyl acetate, sonified and analyzed by gas chromatography using a 6 foot, 6% SP2100 column. No major contaminants were indicated on any of these samples.

No measurable levels of organic vapors were detected using the direct reading organic vapor analyzer.

C. Medical Survey

On July 24, 1979 one of the medical investigators (DW) called Mr. Bob Boyd, Safety Engineer, Signetics Corporation, to apprise him of their wish to visit the Signetics Sunnyvale factory on August 2, 1979. Mr. Boyd was informed of the nature of the evaluation and of the fact that they wished to speak with ten employees whose names had been gleaned from the various information then in their files.

On August 1, 1979 Mr. James Quirk, an attorney from the San Francisco law firm of Brobeck, Phleger, and Harrison called Mr. Belanger informing him that he (Mr. Quirk) represented Signetics Corporation, and that NIOSH and its contract physicians would be denied access to Signetics on August 2, 1979 as he had not adequate time to determine the appropriateness of the investigation. Mr. Belanger then turned the problem over to counsel for HEW. After negotiations between HEW and Mr. Quirk, an agreement concerning NIOSH entry was reached.

*Mention of commercial names or products does not constitute endorsement by NIOSH.

On September 19, 1979, Drs. Whorton and Milby visited the Signetics Sunnyvale facility accompanied by Mr. Belanger. They began with an opening meeting with the following individuals: James Quirk, external counsel representing Signetics Corporation; Robert Silverman, external counsel representing Signetics Corporation in Workers' Compensation cases; H. Corwin Hinshaw, M.D., physician consulted in Workers' Compensation cases, and three Signetics employees--Raymond Vaden, Director of Security and Safety, Bob Boyd, and Paul Yakubek, Safety. Mr. Quirk was the spokesman for Signetics. He informed the investigators that two more individuals on the initial list of ten no longer worked for the company; thus only five still worked for Signetics. He provided the investigators with a collection of medical and personnel records, which he alleged to be the total data available for the ten workers whose names were provided by the HEW attorney. He also offered a computer output, which he alleged to contain all the names of other individuals who had worked in R&D since 1978. This computer output comprised dozens of pages and many hundreds of names. Mr. Quirk informed the investigators that pursuant to the Signetics-NIOSH agreement they were to select a "random sample" of ten of these names for whom Signetics would then produce company personnel and medical records.

The medical investigators stated that they would like also to review the OSHA log and various consultant reports relating to this problem and to meet with Dr. Donald Liddie, Corporate Vice President. Mr. Quirk said that these items would be taken under advisement.

During the visit to Signetics, the medical investigators inverviewed the five persons (from the original list of 10) who were still employed by the Company. They also selected ten additional records from the names on the computer printout provided by Signetics. These 10 selected records included those of several persons whom the investigators had learned during the interviews on the previous day with the three discharged employees who had medical complaints. The 10 selected records were made available for the investigators to review.

After the interviews and review of records had been completed, the investigators asked again to review the OSHA log in the belief that it might provide important insight into the extent of the problem. Mr. Quirk stated that he had not decided whether the investigators could see the OSHA log at all, but in any event, certainly not on that day. He said that he would contact the investigators at a later date with his decision on this matter. With regard to the request to speak to Mr. Donald Liddie, Corporate Vice President, Mr. Quirk stated that he would not allow the investigators to "interrogate" any corporate officers unless the reasons for such a request were previously submitted in writing.

On September 20, 1979 Mr. Quirk provided the OSHA log for the years 1977, 1978, and 1979 together with an accompanying letter. He reiterated his decision regarding interviews or meeting with other Signetics officials. With respect to the request for all medical consultant reports he agreed to provide them at whatever duplicating costs are involved. The investigators pursued neither of these matters any further.

D. Evaluation Criteria

There are several criteria used to evaluate the toxic air contaminants of an employee's work environment: (1) NIOSH Criteria Documents for a Recommended Occupational Health Standard, (2) Proposed and Recommended Threshold Limit Values (TLV's) as suggested by the American Conference of Governmental Industrial Hygienists (ACGIH), 1976, (3) The Federal Occupational Safety and Health Standards (OSHA). In California, Cal-OSHA enforces the ACGIH-TLV's.

The concentration for each contaminant is based upon the current state of knowledge concerning toxicity of these substances. The concentration is designed to allow an occupational exposure up to a 10-hour work day, 40-hour work week as a time-weighted average (TWA) over a normal lifetime without the worker experiencing adverse health effects. In some instances, a few employees may experience discomfort at or below the TWA.

There are some airborne contaminants for which this TWA is inadequate; consequently, the substance may be preceded by the letter "C." This letter indicates a ceiling value for an interval of 30 minutes or less. The ceiling value is used to identify hazardous substances which are fast acting and should never be exceeded.

The following table contains NIOSH recommended criteria. The Cal-OSHA TWA Standard has been cited so that the reader may see which of the substances have been exceeded. However, no discussion of the Cal-OSHA Standard, with respect to measured airborne levels, will be presented.

Table A

Substance	Time Weighted Average (TWA)[a] Concentration (mg/m^3)[b]	Ceiling Value	Minutes
1,1, 1 Trichloroethane (NIOSH)	1092	1910	15
" (Cal-OSHA)	1900	4342	5 min/2 hr
Toluene (NIOSH)	375	750	10
" (Cal-OSHA)	375	1875	10 min/8 hr
Xylene (NIOSH)	435	868	10
" (Cal-OSHA)	435	1305	30 min/8 hr
Methyl chloride (NIOSH)	-	-	
" " (Cal-OSHA)	210	627	5 min/3 hr

a) TWA - NIOSH exposure is based on a work day up to 10 hours long, whereas Cal-OSHA Standard is based on an 8 hour work day.

b) Mg/m^3 - milligrams of contaminant per cubic meter of air.

E. Summary of Findings

Environmental

Thirty-three charcoal and fluorosil tube samples were collected and analyzed for organic vapors. No contaminants were identified on the fluorosil tubes. However, several contaminants (trichlorotrifluoroethane, 1, 1, 1 trichloroethane, methyl chloride, toluene and xylene) were identified on the charcoal tubes. The air levels of these contaminants were well below the NIOSH recommended criteria and the Cal-OSHA standard.

The direct reading OVA analyzer did not detect any chemical contaminants in the old or new R&D laboratories.

Several Signetics personnel attempted to determine whether cross contamination of the laboratory ventilation system was occurring. Anhydrous ammonia was released into one of the laboratory exhaust hoods while chemists monitored several other laboratories which shared the same ventilation system. An amine or amide odor was smelled within seconds after the release of the anhydrous ammonia. It was suspected by the Signetics employees that an organic chemical had cross-contaminated the ventilation system and reacted with the anhydrous ammonia thus producing the amine/amide odor.

Medical

Of the five employees interviewed at Signetics, the majority* had complaints referable to exposure at work which were similar to those of the three discharged employees. (See Attachment 1 for details.) Of the eight employees interviewed by the investigators the majority had Signetics internal Accident Reports forms and/or Doctor's First Report of Work Injury forms in their medical files. Primary signs and symptoms fell uniformly into two categories, irritant and narcotic. The irritant symptoms included sore throat, burning nose, burning tongue, perceived "roughening" of the teeth, metallic taste and chest tightness. Signs consistent with exposure to an airborne irritant included mouth or tongue blisters, nosebleeds, and cough. Symptoms of a narcotic type included headache (frequently severe and lasting for several days), lightheadedness and feeling of swelling of the head. Other less frequent manifestations involved compulsive eating or drinking of fluids, frequent sinus infections, and tingling of the hands, arms or lower extremities.

Of the ten personnel/medical records reviewed at Signetics, (these employees were not interviewed) one or more internal "Accident Reports Form" were included in eight. Complaints voiced repeatedly on these reports were headache, eye and mucous membrane irritation, chest tightness, burning tongue, "blisters" in the mouth, and dizziness. Most of these accident reports were filed from February through August 29, 1979. A few were filed prior to 1979. All of the individuals selected for record review worked in the R&D basement at the time of the filing of the Accident Report Form. These reports are summarized in Attachment 2.

Review of the OSHA logs for 1977, 1978 and 1979 revealed the following entries for "fume inhalation" for the Sunnyvale facility:

	1977 - 39
	1978 - 30
1 Jan - 22 Aug	1979 - 10

Many of the individuals for whom Signetics Accident Report Forms were filed (and of which the investigators are directly aware) were not listed in the OSHA log. In fact, for the ten employees whose records were examined but who were not interviewed, none of the numerous incidents which apparently led to the filing of Accident Report Forms were entered into the OSHA log.

*To reveal exact numbers in so small a study group would compromise anonymity, thus the less precise but sufficiently descriptive term "Majority" is used here.

F. Conclusions

Environmental

Based upon the environmental air samples collected during June 14-15 1979 in the R&D building, no excessive chemical exposures to organic vapors were identified. However, air sampling was not performed for all the chemicals identified on the inventory list which was made available to the NIOSH investigator.

The history of the problems indicates that the ventilation system was in need of repair, and that cross contamination of the ventilation system may have occurred. Furthermore, the ventilation experiment with anhydrous ammonia seems to support the theory that cross contamination of the R&D ventilation system was occurring.

Based on the preliminary study, it is concluded that a thorough evaluation of the ventilation system must be conducted in order to assure that cross-chemical contamination does not occur.

Medical

The problem that was originally identified in the R&D building in August 1977 continues to the present time. The last known new case that was identified (even within the limitations of this evaluation) had onset of symptoms on August 29, 1979.

The health complaints appear to fall into two categories: an irritative-sensitizing phenomenon involving mucous membranes, eyes, and lungs, and a narcosis effect characterized by intermittent headache, lightheadedness and giddiness. The investigators have not, in the course of their professional experience, encountered a problem quite like this one. Nor are they aware of publications by other medical investigators that would shed substantial light on this matter. However, they wish to state most emphatically that in their opinion there exist one or more agents in certain areas of the Signetics workplace environment which, upon becoming airborne, possess the capability to irritate mucous membranes and induce an altered state of response in some persons. In addition, certain of the responses consistently reported by Signetics employees suggest the possibility of intermittent exposure to a narcosis-producing agent. The investigators are not optimistic over the possibility of this agent (or these agents) ever being specifically identified.

Because this Health Hazard Evaluation was carried out in the face of substantial restrictions, the true population at risk and the true population affected could not be satisfactorily identified.

Reliance on the OSHA log would not have alerted plant management, OSHA, or the investigators to the existence of workplace-related health complaints at the Signetics plant.

Based on the information that has been obtained, it appears that the most useful preventive measure would be to improve the ventilation system. Suggestions as to how this improvement could be accomplished would require more complete evaluation by qualified engineers.

G. Recommendations

Based on the results of the preliminary study described in this report, it is NIOSH's opinion that a significant occupationally-related health problem exists at the Signetics Sunnyvale facility. Because of the constraints placed upon the investigation, neither the nature nor the extent of the problem could be defined to the investigators' reasonable satisfaction. Accordingly, we recommend that a larger, more systematic study be undertaken at the facility in order to:

1. Fully characterize the present medical problem.
2. Determine the number of employees affected.
3. Formulate practicable control procedures.

Although the investigators doubt that a clear-cut etiologic agent can be identified, the investigators would anticipate that a properly designed, installed, and functioning ventilation system would solve the problem.

AUTHORSHIP AND ACKNOWLEDGEMENTS

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ACKNOWLEDGEMENTS

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ATTACHMENT 1

Summary of the three discharged

Ex-Signetics Employees' Medical History

Patient 1

In September 1977 two weeks after beginning work in the R&D building, she developed a sore throat, productive cough, "ulcers" in the mouth, difficulty breathing, tightness in the chest, chest and back pains, and metallic taste in the mouth. Her menses became irregular at about the same time. She characterizes her headaches as severe without nausea or vomiting and describes the pain as starting in the back of her head and spreading over the top to her forehead. She requires narcotic-type analgesics for pain relief. She reports having gained 40 or more pounds since beginning at Signetics, but denies any change in her eating habits. She also reports having "gained an inch in height, and a full shoe size." In February 1978, she had "a hallucinogenic reaction," in which she became disoriented and her "eyes dilated." She was taken to Peninsual Hospital, where she remained for two days. The cause for this illness remains unknown, but is related by her to workplace exposure. (To what she is unable to say.) In August of 1978, her workplace was changed to a table in the cafeteria in the Signetics building to avoid further exposure. Even though she considered this assignment very humiliating she endured it to avoid further medical problems at work. She remained in the cafeteria for 12 months until discharged in July 1979.

Patient 2

In the fall of 1977 she became aware of what she believed to be work-place related health problems. She described a sudden onset of chest problems consisting of pain and congestions, followed shortly thereafter by blisters on her tongue, nosebleeds, sore throat, cough, and tingling of the fingers and body. Her workplace was changed to a cafeteria table in August 1978 where she remained until she was discharged in July 1979.

Although at the time of this interview, the patient has not worked at Signetics for several months, she is still troubled by episodes of unpleasant sensations, such as headache, burning of the mouth, and sore throat when she comes into the vicinity of certain chemicals such as detergents in the grocery stores, copy machines in offices, or near fresh newspaper print. Since being discharged from Signetics she is nervous and irritable and feels on the verge of depression.

Patient 3

In early 1976 she began noticing health problems which included severe mood changes, burning of the tongue, "scorched mouth," strong metallic taste in

the mouth, high pulse rate and chest discomfort. She developed severe headaches which started in the neck and progressed to the forehead. These headaches were accompanied by dizziness and nausea and lasted for many hours. Her menstrual flow diminished. In August 1978 she was moved to the cafeteria to avoid further work exposure. Even though she considered this assignment denigrating and intentionally humiliating she endured it to avoid further medical problems at work. She remained at the cafeteria until discharged in July 1979. The patient has continued to experience these symptoms since being discharged from Signetics several months ago. She now notes an exacerbation of symptoms such as burning of the tongue, sore mouth and severe headaches when she comes into the vicinity of detergents in the grocery store or within close proximity to certain colognes and perfumes worn by others.

ATTACHMENT 2

Notes from SIGNETICS Accident Reports from

10 records examined without interview

RECORD A

8.27.79: Inhaled chemical fumes coming through air conditioning, had to leave work at 3 p.m. Headache, chest, and eye symptoms.

3.7.79: Inhaled fumes which caused headache, eye irritation, and sore throat.

RECORD B

8.27.79: Inhalation of fumes of unknown type and source. Caused difficulty in breathing, sinus and nose discomfort, eye irritation. Had to leave work. Doctor's First Report of Work Injury filed 8.27.79. Skin dryness, nose tingling, headache for six months. Negative physical examinations. Diagnosis: alleged fume exposure.

RECORD C

8.31.79: Inhaled fumes, noted burning in chest and burning in mouth, particularly the tongue. Developed headache.

3.7.79: Inhaled fumes of unknown nature. Burning in eyes and slight breathing problem, also burning in mouth, developed headache.

2.19.79: Developed headache probably due to fumes. Eye burning.

2.12.79: Inhaled fumes in office. Burning sensation, nose and mouth, followed by burning in eyes. Also felt slightly giddy.

RECORD D

2.12.79: Some kind of fumes coming in through air vent, causing dry throat and dizziness.

RECORD E

2.19.79: Headache and irritated eyes. R&D basement.

RECORD F

8.29.79: Basement area, R&D Building full of foul smell today. Forced to go home early. Sore throat, headache, tired feeling in eyes.

8.27.79: Fairly strong chemical fumes in the basement of R&D Building produced uncomfortable feeling. This has been going on for several months. Am forced to go home at 3 p.m. Eye and chest symptoms.

3.7.79: I felt strong fumes from an unknown source the moment I entered the R&D Basement. Eyes and throat irritation resulted from the fumes. The entire basement area appears to be affected. Unable to work, went home. In spite of repeated complaints over a period of several weeks, Safety hasn't even bothered to check. Eye, head, and neck symptoms.

3.7.79: I felt strong fumes from an unknown source the moment I entered the R&D Basement. Eyes and throat irritation resulted from the fumes. The entire basement area appears to be affected. Unable to work, went home. In spite of repeated complaints over a period of several weeks, Safety hasn't even bothered to check. Eye, head, and neck symptoms.

RECORD G

2.16.79: Developed headache after being in Lab for sometime.

2.29.79: After being in Lab for a few hours I began to have headaches.

2.20.79: Developed headache while in Lab. Left area and headache disappeared. Returned and got headache again.

1.20.78: Noticed blisters in mouth when others also had been complaining of similar incidents. Reported this to the nurse.

RECORD H

6.22.79: Starting in the fourth week, rash and respiratory difficulty developed. Deadly fumes from the Fab Labs. Symptoms in arms and legs. Rash and respiratory symptoms.

RECORD I

No accident forms in folder.

RECORD J

No accident forms in folder.

TABLE I

Summary of Bulk Area Air Samples Collected
From Research and Development Department

Signetics Corporation
Sunnyvale, California

June 14-15, 1979

Date	Sample Number	Job Classification or Location	Sampling Period	Sampling Volume (Liters)	Sample Concentration mg/m^3[1] Trichlorotrifluoroethane[2]	1,1,1 Trichlorethane	Methyl Chloride	Toluene	Xylene	Total Alkanes
6/14	CT-1	Room 116	1025-1130	33	14.2	0.3	3.9	N.D.	0.6	N.D.[3]
6/14	CT-2	Room 124	1038-1140	31	7.4	0.3	2.6	0.3	1.3	N.D.
6/14	CT-3	R&D West Lobby	1050-1150	30	17.3	0.3	3.3	0.3	1.0	1.7
6/14	CT-4	Room 116	1134-1235	30	7.0	0.3	0.3	N.D.	0.3	N.D.
6/14	CT-5	Room 124	1145-1250	33	3.3	1.5	1.5	0.3	0.6	N.D.
6/14	CT-6	R&D West Lobby	1155-1255	30	4.7	N.D.	3.3	N.D.	0.3	N.D.
6/14	CT-7	Room 114	1240-1340	30	9.3	0.6	2.3	0.3	0.3	N.D.
6/14	CT-8	Room 124	1255-1355	30	6.7	0.3	2.0	0.3	0.3	N.D.
6/14	CT-9	R&D West Lobby	1300-1400	30	9.7	N.D.	3.0	0.3	0.3	N.D.
6/15	CT-11	Room 97-Basement	0845-0952	34	7.3	1.8	3.2	0.3	0.3	N.D.
6/15	CT-12	Room 74-Basement	0845-1010	43	8.8	0.7	3.9	0.2	0.2	N.D.
6/15	CT-13	Hallway outside Rm 9&11	0850-1020	45	6.7	0.7	3.1	0.2	0.2	N.D.
6/15	CT-14	Room 97	1005-1105	30	1.7	2.3	4.3	N.D.	0.3	N.D.
6/15	CT-15	Room 74	1015-1110	33	1.8	1.8	4.2	N.D.	0.3	N.D.
6/15	CT-16	Hallway outside Rm 9&11	1025-1130	33	9.7	2.1	4.5	0.3	N.D.	N.D.
6/15	CT-17	Room 95 - Basement	1105-1200	28	8.6	2.5	5.3	0.3	N.D.	N.D.

1. mg/m^3 - Approximate milligrams of contaminant per cubic meter of air.
2. Trichlorotrifluoroethane - The specific isomer of this fluorocarbon could not be identified.
3. N.D. - None Detected
4. TWA - Time Weighted Average

NIOSH Criteria
1. 1,1,1 Trichloroethane-1092mg/m^3 TWA[4]
2. Toluene - 375 mg/m^3 TWA
3. Xylene - 434 mg/m^3 TWA

CAL-OSHA Standard
1. Methyl Chloride - 210 mg/m^3 TWA