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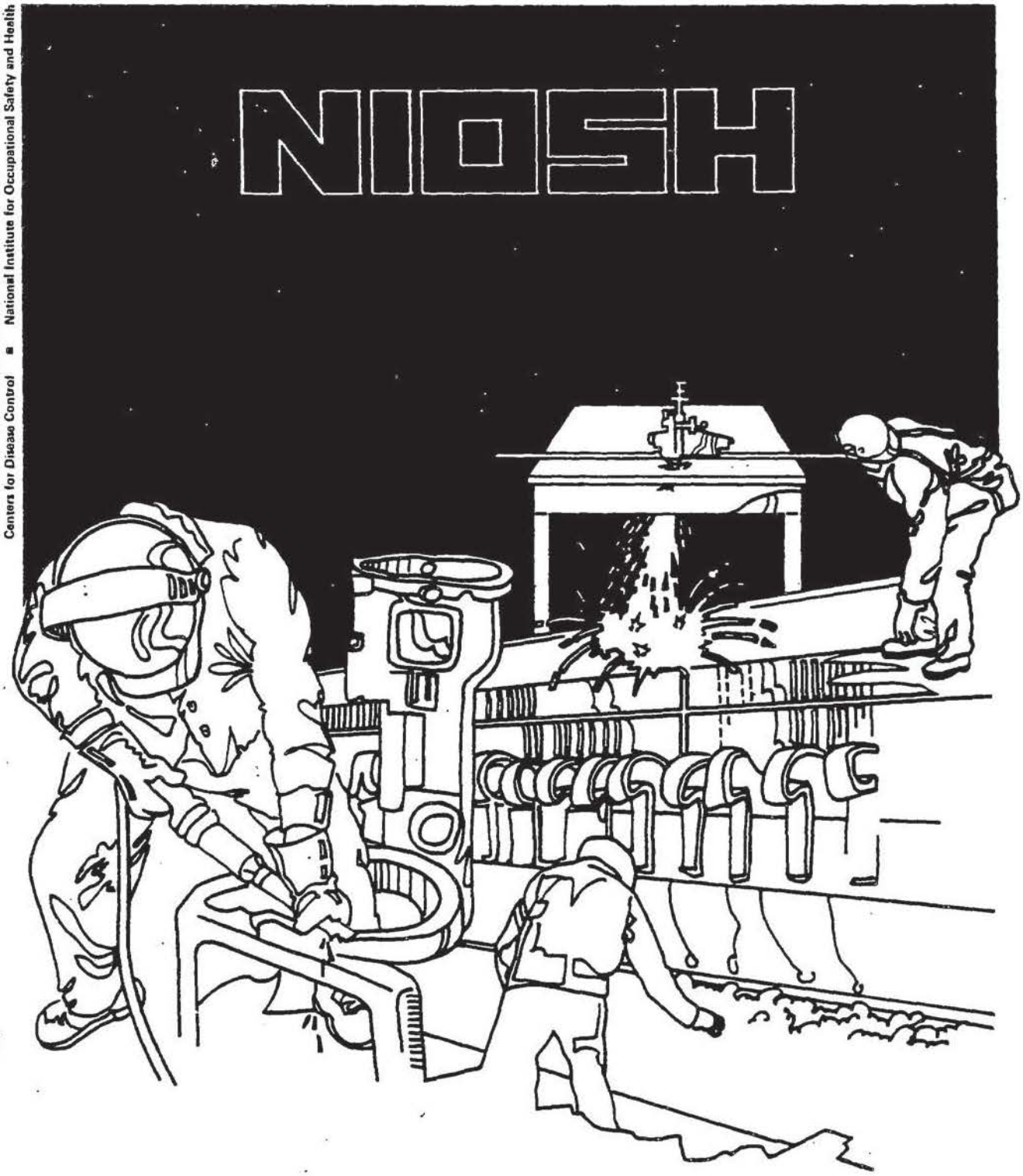

Health Hazard Evaluation Report

HETA 84-513-1572
HAWAII NEWS AGENCY
HONOLULU, HAWAII

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.

An evaluation of the questionnaires showed that the majority of the Star-Bulletin employees felt that their offices were too cold whereas the Advertiser employees in general felt that the temperature was comfortable. Employees from both newspapers felt that the air was stuffy. An analysis of the symptomatology data indicated that the employees of the Star-Bulletin were more likely to have a history of "allergy" and frequent upper respiratory irritation than the Advertiser employees and also less likely to be free of symptoms. No significant relationships were found between gender and symptoms or smoking status and symptoms.

On the basis of the environmental and medical information obtained, NIOSH concluded that the ventilation system in some areas of the Star-Bulletin side of the Hawaii Newspaper Agency Building seemed to be providing less than optimal air circulation and that the ventilation system for the whole Building needed further evaluation. Some of the employees who expressed having symptoms of irritation at work might have their adverse effects improved with better air circulation. Recommendations for improving air movement are included with this report.

KEYWORDS: SIC 5199 (Nondurable Goods, Not Elsewhere Classified), newspaper company, indoor air quality, temperature, air flow, carbon dioxide, carbon monoxide.

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I. SUMMARY

In September, 1984, the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate the indoor air quality within the Hawaii News Agency (HNA) Building in Honolulu, Hawaii. Reporters, editors, and other office personnel were reported to be experiencing continuous cases of flu, colds, sneezing, headaches, and other respiratory problems.

On October 17 and 18, 1984, the NIOSH investigator visited the HNA Building to obtain information about the ventilation system, to distribute a short questionnaire to employees inquiring about symptoms at work, to investigate general working conditions, and to make measurements for carbon dioxide (CO2) and carbon monoxide (CO).

On October 17, 1984, CO2 measurements were taken with a length-of-stain indicator tube with a lower limit of detection which was slightly above the normal outdoor CO2 level of 0.03 to 0.04%. This instrument was used as a screening device, and the measurements were repeated on October 18, 1984, with a more sensitive indicator tube and also an infrared analyzer. On October 17, the CO2 indicator tube showed a faint color change in most areas of the Star-Bulletin and Advertiser areas of the Building. The color change was slightly more pronounced in the Today Section of the Star-Bulletin. This result was an indication that the CO2 levels were higher in the Today Section, but the levels could not be quantified. During the morning of October 18, 1984, a more sensitive indicator tube was used, and the CO2 levels throughout the Building were 0.08% and outdoors were 0.04%. An infrared analyzer was also utilized, and the instrument showed CO2 levels of 0.08% throughout the Building except in the Today Section where the concentration was 0.09% (the NIOSH criteria for CO2 is 5.0% based on an 8-hour time-weighted average). The higher carbon dioxide readings in the Today Section were an indication that air circulation was poorer in this area although the difference was not very great. During the afternoon of October 18, the CO2 measurements were repeated and readings for carbon monoxide were also taken. The CO2 level dropped to 0.05% in the Star-Bulletin side of the Building and remained at 0.08% in the Advertiser side. Carbon monoxide measurements throughout the Building showed levels less than 2 parts per million (ppm). These levels were well below NIOSH criteria for carbon monoxide of 35 parts per million based on an 8-hour TWA.

A visual inspection of the ventilation system could only turn up one second floor return air registry for each half of the Building. These return air registries did not appear to be exhausting sufficient amounts of air volume based on visual observations with a smoke tube.

II. INTRODUCTION

On September 5, 1984, the National Institute for Occupational Safety and Health (NIOSH) received a request from an authorized representative of employees from the Hawaii Newspaper Agency (HNA), Honolulu, Hawaii, to conduct a health hazard evaluation of the indoor air quality in the HNA Building. The requestor was concerned about the incidence of colds, flu, and sore throats which seemed to linger among employees in the Star-Bulletin side of the Building.

On October, 17, 1984, the NIOSH investigator visited the Building in order to obtain information on the ventilation system, to pass out a short questionnaire concerning possible workplace related symptoms, and to take detector tube readings for carbon dioxide (CO2). On October 18, 1984, the NIOSH investigator repeated CO2 samples and also took detector tube readings for carbon monoxide (CO). The detector tube measurements for CO2 and CO were used as a screening device to assess the general air circulation in the office spaces.

III. BACKGROUND

A Building Layout and Organization

The Hawaii Newspaper Agency is responsible for managing two newspapers in one building. The Honolulu Advertiser is the morning newspaper and the Honolulu Star-Bulletin is the evening edition. The newspapers are separate corporations which share the same building. The building was constructed in 1929 and occupied a busy corner in downtown Honolulu. It qualifies as a historic building, and therefore, only certain modifications are allowed which do not alter the basic stucture of the building. The building has two and one-half floors. The first floor housed the administrative and circulation offices of the HNA. The second floor housed the editorial offices of both newspapers and was the floor of concern for this health hazard evaluation. The third floor was made up of several offices and a cafeteria for the employees.

The Star-Bulletin occupied the eastern half of the building. The editorial working area was approximately 50 X 100 feet and can be considered as mostly open space except some sections were divided by walls and baffles so that areas seemed to be partially enclosed. The front section was identified as a "general" office area; the middle of the floor contained the editorial or "copy" area; and the rear of the floor housed the "Today" section. About 75 editors, reporters, and other personnel were assigned to this area although not all of them were in the office at any given time. An almost identical sized working area was located on the western side of the building. This area housed the editorial (copy) and other staff of the Honolulu Advertiser. Approximately the same number of employees were assigned to this area which had essentially all open space. A common library helped physically separate the newspapers. The

writing and editing functions for each newspaper were similar in that all the employees worked at desks with video display terminals (VDT°s). It was noted that many of the VDT°s in the Star-Bulletin side had newspapers attached to the screen to act as glare shields. No chemicals were used in the editorial areas of the building. However, a common composing room (where chemicals were used) was located in back of the editorial areas of both newspapers. The composing room was separated via walls and doors from the editorial areas. A small photography developing room was located to the rear of the library, but this room was closed off from the remainder of the second floor. At both newspapers, smoking and non-smoking employees were not segregated.

B. VENTILATING SYSTEMS

The Hawaii Newspaper Agency Building was built in 1929, but air-conditioning was not installed until 1962. Because the building is classified as a historical landmark, only certain types of modifications can be made on it. Since the original installation of the air-conditioning system, modifications have been made on the air-conditioning system as units were added and deleted according to needs. Three air handlers and two chillers (which were located on the roof) provide ventilation for the building. Information was not available as to how much of the make-up air was outdoor air versus recirculated air, but the maintenance person seemed to feel that a majority of the make-up air was outdoor air. The building itself was not a sealed building as windows could be opened and there were many sources of air leaks. An attempt was made to gather information from the air-conditioning blueprints, but these had been marked over and were difficult to interpret. The air handling system seemed to be well maintained. The filters were changed as needed when indicated by the pressure drop. Re-entrainment of contaminants into the air-conditioning system did not appear to be a problem.

The blueprints for the second floor indicated that there was only one return air registry for the Star-Bulletin side. A visual inspection of the second floor indicated that this fact was apparently true as no other return registries could be located. This registry was located near the Today section. The blueprints indicated that the return registry on the Star-Bulletin side was rated for 4405 cubic feet per minute (cfm). The dimensions of the return registry were 2 X 4 feet (8 square feet). Therefore, in order to exhaust 4405 cfm, the average velocity through the return registry had to exceed 500 feet per minute (fpm). It was estimated that the flow was less than 100 fpm through this registry using smoke tubes as an indicator.

IV. EVALUATION METHODS AND DESIGN

A. ENVIRONMENTAL AND VENTILATION

Other than reviewing information about the ventilation systems, further study involved obtaining detector tube samples for carbon dioxide (CO2) and carbon monoxide (CO) in selected locations on the second floor of both the Star-Bulletin and Advertiser sides of the building. Additionally, CO2 levels were repeated with an infrared analyzer as supplementary data.

B. GENERAL QUESTIONNAIRE

After the opening conference with management and a representative of employees (Administrative Officer of the Hawaii Newspaper Guild), arrangements were made to distribute and explain the purposes for obtaining information from a short questionnaire. The questionnaire requested employees to respond to questions concerning symptoms related to work, history of allergies, smoking history, job descriptions, and the use of office equipment on the job. Questionnaires were distributed to most of the employees present at both the Star-Bulletin and the Advertiser. The employee representative provided questionnaires to workers from different shifts and would be the repository for the completed ones. These were to be mailed to the NIOSH San Francisco Office at a later date and would be analyzed by the Medical Investigative Officer at the NIOSH Denver Regional Office.

V. EVALUATION CRITERIA

A. Ventilation adequacy was estimated from the potential for carbon dioxide buildup within an occupied area. Air normally contains about 0.03% CO2. As most living creatures, including man, produce CO2 as an end product of metabolism, if an enclosed area is occupied and not adequately ventilated, the concentration of CO2 will gradually build up. Carbon dioxide is also produced by combustion, such as smoking. Carbon dioxide levels found in this study would have no adverse health effects.

Neither NIOSH nor OSHA has developed ventilation criteria for general offices. Criteria often used by design engineers are the guidelines published by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE). Until recently the ASHRAE Ventilation Standard 62-73 (1973) was utilized, but recommendations were based on studies performed before the more modern, air-tight office buildings became common. These older buildings permitted more air infiltration through leaks in cracks and interstices, around windows and doors, and through floors and walls. Modern office buildings are usually much more airtight and permit less air infiltration. Consequently, ASHRAE has revised its standard and has published the new one, ASHRAE 62-1981, "Ventilation for Acceptable indoor Air Quality."

In the Standard, it is stated that indoor air quality for "General Offices" shall be considered acceptable if the required rates of acceptable outdoor air cited in the Standard are provided for the occupied space and no unusual indoor air contaminants are present. These rates of outdoor air are necessary to dilute the CO2 produced by metabolism and expired from the lungs. In offices without smoking, the minimum outdoor air requirement is 5 cubic feet per minute (cfm) per person based on an occupant density of 7 persons per 1000 square feet. If smoking is allowed, the minimum outdoor air requirement increases to 20 cfm per person.

B. Carbon monoxide is produced when carbon containing compounds are burned in a limited supply of air. The likely sources of CO in this study would be from automobile exhaust and cigarette smoke. Small quantities result from the metabolic breakdown of hemoglobin in man, but the amounts would be too small to measure by the methods used in this study. Carbon monoxide binds to hemoglobin in the red blood cells 220 to 290 times more strongly than does oxygen. This impairs the blood's ability to carry oxygen to the tissues of the body. The effects of overexposure to CO include headaches of progressive severity, nausea, decreased manual dexterity and judgment, and at higher levels coma, convulsions, and death.

Three sources of criteria used to assess the workroom concentrations of chemicals are (1) NIOSH criteria for recommended standards, (2) recommended Threshold Limit Values (TLV's) and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH), and (3) Occupational Safety and Health Administration (OSHA) standards (29CFR 1910.1000).

	Permissible Exposure Limits 8-hour time-weighted average Exposure in parts per million (ppm)
Carbon Monoxide.....	35 ppm (NIOSH) 50 ppm (TLV and OSHA)

C. General Questionnaires inquiring about health effects in the workplace, smoking habits, and overall comfort were passed out to employees of both newspapers who expressed an interest in responding. The employees were instructed to fill out the questionnaires and return them to the representative of employees. Additional questionnaires were left for employees from other shifts since the newspaper operations ran on more than the day shift. The questionnaires would be sent to NIOSH at a later date for analysis.

VI. RESULTS AND DISCUSSION

A. Ventilation

Ventilation was assessed by taking measurements for carbon dioxide (CO2) in selected areas of the second floor and by using a smoke tube to visually determine the rate of air flow out the single return registry on the Star-Bulletin side of the building. The specifications called for 4405 cubic feet per minute (cfm) through the return registry which had dimensions of 2 X 4 feet (8 square feet). To exhaust this amount of air would require an average face velocity of 500 feet per minute (fpm) at the return registry. The smoke tube indicated that air was not being exhausted very fast (estimated at 100 fpm or less). The Star-Bulletin half of the building contained work areas that were more enclosed. The "Today" section was located in the rear of the Star-Bulletin side. It had approximate dimensions of 20 X 30 feet and was enclosed on three sides. One wall separated it from the "Sports Desk" and another wall separated it from the Art Department. Because of this enclosure and the lack of adequate flow through the return air registry, the general air movement in the Today section seemed less than in the more open copy area.

Carbon dioxide was measured on two consecutive days at the Hawaii News Agency Building. On October 17, 1984, CO2 measurements were taken with a Bendix-Gastec Model 400 pump and CO2 tubes with a range of 0.25% to 3% with two pump strokes. This range could be cut in half by doubling the number of pump strokes (0.13 - 1.5%). The lower limit of detection (0.13%) was not low enough to detect normal outdoor CO2 levels of 0.03%, but the more sensative Draeger indicator tubes were not available for the first day of the study. It was hoped that any elevations in CO2 could be detected with the Bendix-Gastec instrument. On October 17, 1984, CO2 measurements were taken in the Today and general editorial sections of the Star-Bulletin and in the general editorial area of the Honolulu Advertiser. In the general editorial areas of the Star-Bulletin and Advertiser, the CO2 level was estimated as a trace since the indicator color change was minimal. The CO2 level in the Today section was estimated to be higher than a trace (based on a greater color change) but still not quantifiable. Thus, using the Bendix-Gastec instrument, the only conclusion that can be drawn based on the color change was that the CO2 level was higher in the Today section than in the general editorial areas of both newspapers. On this day, eight employees were in the Today section.

On October 18, 1984, measurements for CO2 were repeated with a Draeger pump and CO2 tube with a range of 0.01 to 0.3% CO2 by volume for 10 pump strokes. The first set of measurements were taken during mid-morning. The CO2 levels in the Today section, the general editorial area of the Star-Bulletin, and the general editorial area of the Advertiser were all approximately the same with the Draeger instrument. The CO2 levels were

.08%. Outdoors, the CO2 level measured 0.04%. A Wilks-Miran Model IA Infrared (IR) Analyzer was also used for comparison by an industrial hygienist from the Hawaii Division of Occupational Safety and Health's Occupational Health Branch who accompanied NIOSH on this day. The IR analyzer was calibrated indoors assuming the Draeger reading of 0.08% and measurements were taken in the building. The Draeger tubes indicated that CO2 levels were the same throughout most of the building, but the infrared analyzer read 12% higher in the Today section (0.09% vs. 0.08%). This finding was an indication that air circulation was slightly poorer in the Today section of the building. On this day, only two employees were working in the Today section. During the previous day when the Today section was full of employees, an elevation in CO2 was discernable with a less sensitive indicator tube.

On October 18, 1984, carbon dioxide and carbon monoxide readings were taken with the Draeger instrument late in the afternoon during peak communiting times. There was a concern that CO might be entering the building from the streets. The CO level in the parking lot was 3 parts per million (ppm). In the Star-Bulletin side, the CO level was approximately 1 ppm in the Today and general editorial areas. The CO level was 2 ppm in the Advertiser side. All these CO levels were well below the NIOSH recommended limit of 35 ppm based on an eight-hour time-weighted average and was an indication that CO was not entering the building and was not a problem. Carbon dioxide readings were also repeated in the afternoon. In the Star-Bulletin side, the CO2 levels dropped to 0.05% in the Today and general editorial areas. In the Advertiser side, the CO2 level remained at 0.08% throughout the floor. Thus, the CO2 level dropped in the Star-Bulletin side as one would expect since most of the employees had gone home for the day.

B. GENERAL QUESTIONNAIRES

The questionnaire data was analyzed and the number of variables were reduced to a manageable figure. The variables considered were the following:

1) Department: Today Department - Star-Bulletin
   Other Departments - Star-Bulletin
   All Departments - Advertiser

2) Shift: Morning - Any shift starting by 11 A.M.
   Evening - Any shift starting after 11 A.M.

3) Years of employment

4) Age

5) Sex

6) Temperature perception - hot, cold, or good

7) Air movement perception - stuffy, drafty, okay

8) Current Smoking Status - yes or no

9) History of allergy - there was no medical confirmation of for those with "allergy" and those with possible allergy so that these people were classified as one group.

10) Symptomatology - frequent symptoms
occasional symptoms
no symptoms

11) Symptom Groups: Headache
Upper respiratory irritation (includes dry or sore throat, nasal or sinus congestion, or cough)
Lower respiratory irritation (includes wheezing, shortness of breath, or lung or chest tightness)
Eye irritation
Other symptoms not related to irritation as described above

There were several statistical significant differences found after an analysis of the data was made using a Chi-square statistical test. One of the differences was that the Star-Bulletin employees overwhelmingly felt that their offices were on the cold side whereas the Advertiser employees distributed (as one might expect) with the majority feeling that the temperature was good and about equal proportions feeling that it was either too hot or too cold. The majority of workers at both newspapers felt that it was too stuffy in the offices.

An attempt was made to relate symptomatology to the requesting department or newspaper, and to relate other symptoms to the presence of "allergy." Employees of the Star-Bulletin are more likely to have a history of "allergy" and frequent upper respiratory irritation, and less likely to be free of upper or lower respiratory irritation. Those with a history of allergy are also less likely to be free of upper or lower respiratory symptoms or to be symptoms-free. As symptoms of upper or lower respiratory irritation might be due to allergy or at least interpreted as "allergy," this association is not surprising. Frequent eye irritation is somewhat anomalous, but could relate to the nature of the work and the lighting as well as to any substances in the air. No significant relationships were found between employee gender and symptoms or smoking status and symptoms.

VII. CONCLUSIONS

1. There appears to be less air circulation in the Today section of the Star-Bulletin side of the building as evidenced from the lack of air movement through the return air registry and the slight elevation in the carbon dioxide levels in the Today section over the front areas of the floor.

2. The slightly elevated carbon dioxide levels (0.8%) throughout the building when fully occupied suggests that additional fresh air might be desirable.

3. The employees at the Star-Bulletin are colder and report more respiratory irritation than employees at the Advertiser

4. No significant relationships were found between gender of employees and symptoms or smoking status and symptoms

VIII. RECOMMENDATIONS

1. The ventilation system should be serviced by a mechanical engineering firm to insure that it is performing according to specifications.

2. The specifications of the ventilation system should be checked to insure that enough outdoor air can be introduced into the second floors of both newspapers to meet the recommendation of a minimum of 20 cubic feet per minute per person by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

3. As part of the ventilation survey, the return air registries on the second floor of both newspapers should be checked to see that they are functioning properly.

4. Since the Today Section of the Star-Bulletin is more enclosed, efforts should be made to improve the air circulation if it does not meet the minimum ASHRAE recommendations.

5. Glare shields should be installed where necessary on the video display terminals.

IX. REFERENCES

1. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. ASHRAE Standard 62-1981, "Ventilation for Acceptable Indoor Air Quality," Atlanta, Georgia, 1981.

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X. DISTRIBUTION AND AVAILABILITY

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Copies of this report have been sent to:

1. Hawaii Newspaper Agency
2. Hawaii Newspaper Guild
3. NIOSH - Region IX
4. U.S. Department of Labor/OSHA - Region IX
5. State Designated Agency
6. Hawaii Department of Health

For the purpose of informing affected employees of the Hawaii Newspaper Agency, a copy of this report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.