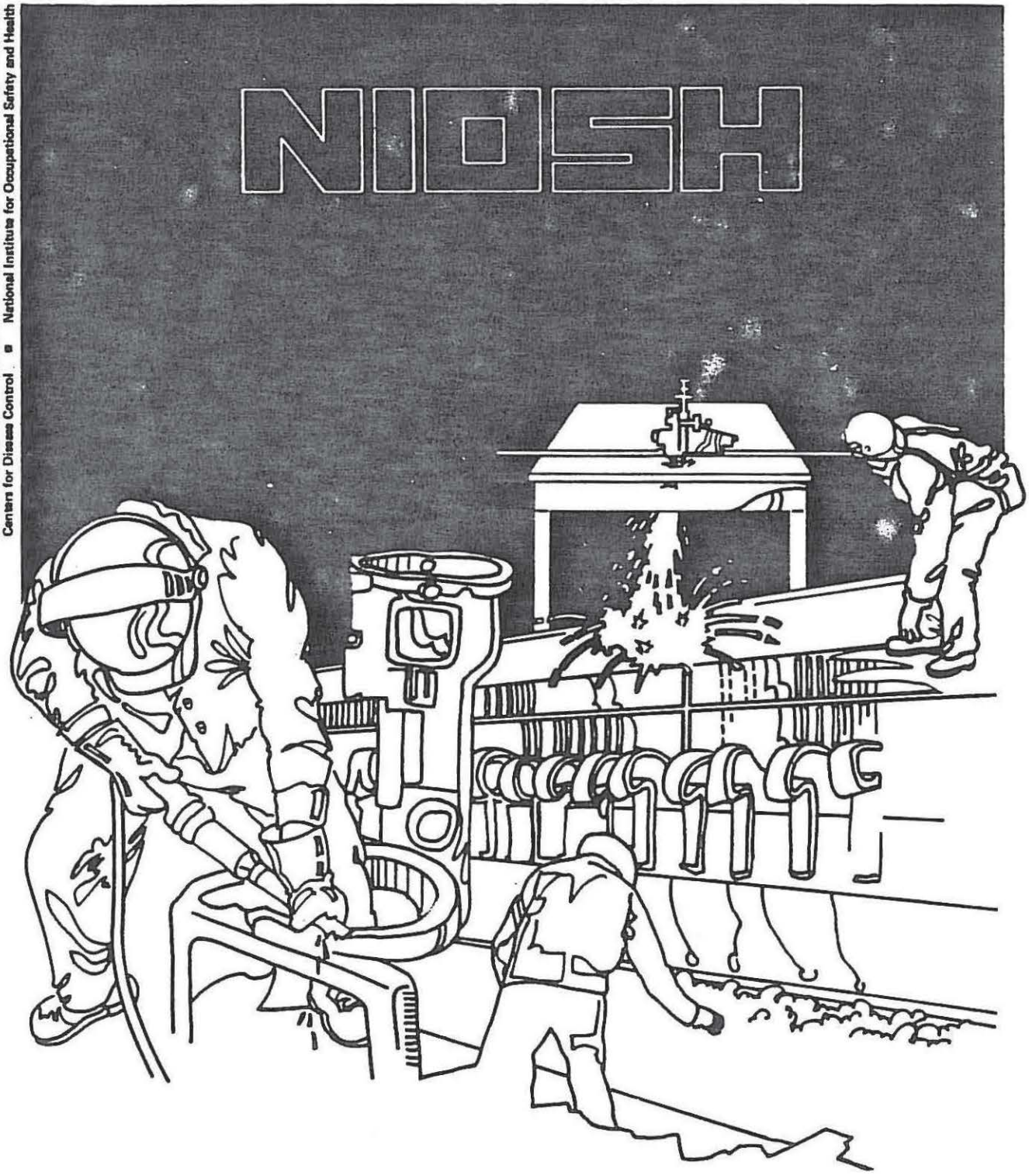
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
Centers for Disease Control ■ National Institute for Occupational Safety and Health




# Health Hazard Evaluation Report

HETA 79-129-1350
SAN FRANCISCO NEWSPAPER AGENCY
SAN FRANCISCO, CALIFORNIA

## 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.

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SAN FRANCISCO NEWSPAPER AGENCY
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## I. SUMMARY

On August 8, 1979, the National Institute for Occupational Safety and Health (NIOSH) received a request for a Health Hazard Evaluation at the San Francisco Newspaper Agency, San Francisco, California. There was concern that pressmen may be exposed to excessive airborne concentrations of ink mists and paper dust, and that workers may be suffering from an excess of respiratory problems.

On August 30, 1979, an initial medical and environmental survey was conducted. Follow-up surveys were conducted January 14-18, 1980 and February 27-29, 1980. Twelve bulk paper samples were collected and anaylzed for asbestos fibers, but none were detected. Six bulk ink samples were analyzed for metal particulates, and one ink (black) was analyzed for polynuclear aromatics (PNA). Inorganic lead was the only metal identified at a level greater than one percent in one of the two red inks. No PNA's were identified. Twelve personal breathing zone and general area air samples were collected for evaluation of exposure to inorganic lead and paper dust. No lead was detected and the paper dust concentrations ranged from 0.31-2.41 $mg/m^3$ (milligrams of a substance per cubic meter of air). The California-Occupational Safety and Health Administration (Cal-OSHA) standard for total airborne particulate is 10 $mg/m^3$. Fifty-four personal breathing zone and general area air samples were collected for ink mists (mineral oil mist) and nuisance particulate. The ink mist concentrations ranged from 0.12-3.29 $mg/mg^3$; all were below the Cal-OSHA standard of 5 $mg/m^3$. The total particulate concentrations ranged from 0.31-4.24 $mg/m^3$.

A respiratory symptom questionnaire and pulmonary function tests were administered to 187 workers. Press room workers were found to have a significantly higher rate of chronic bronchitis symptoms than reel room workers after adjusting for smoking history and age. Pulmonary function performance declined with age and years of press work, but these variables were so closely correlated that an independent effect for years of exposure could not be evaluated. Dermatitis and eye irritation due to oil mist and paper dust exposure were reported by 40% of the workers.

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On the basis of this evaluation, NIOSH has determined that employees working in the press room or reel room were not overexposed to asbestos, inorganic lead, ink mists or total nuisance dust on the dates of this survey. However, press room workers had a significantly higher rate of chronic bronchitis symptoms than reel room workers, after adjusting for smoking history and age. Smokers reported a higher rate of several other respiratory symptoms. Both age and years worked in press rooms contributed to decreased pulmonary function; these effects could not be separated. Dermatitis and eye irritation due to diesel oil and paper dust were also prevalent. Recommendations are included in Section VII of this report.

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KEYWORDS: SIC 2711 (Newspapers: Publishing, Publishing and Printing) paper dust, ink mists, printing.

## II. INTRODUCTION

On August 8, 1979 the National Institute for Occupational Safety and Health (NIOSH) received a request from the President of the Web Pressmen and Platemakers local union #4 to conduct a health hazard evaluation at the San Francisco Newspaper Agency. The requestor was concerned that employees may be exposed to excessive levels of ink mists and paper dust, and there was concern that workers may be suffering from an excess of respiratory problems. Several employees were concerned about asbestos exposure from the printing paper.

On August 30, 1979 an initial environmental and medical survey was conducted. An interim report was sent to the requestor and company representatives in October, 1979. Bulk paper samples were analyzed for asbestos fibers and bulk ink samples were analyzed for metalic composition prior to conducting the follow-up survey. A follow-up medical survey was conducted January 14-18, 1980, and a follow-up environmental study was conducted February 27-29, 1980. The environmental results were forwarded to the union and company representative in July, 1980 with a follow-up telephone call to each. Individual workers were notified of the results of the pulmonary function testing in May, 1980.

## III. BACKGROUND

The San Francisco Newspaper Agency is owned by the San Francisco Examiner and the San Francisco Chronicle; however, the agency employs its own staff and operates independently of the two companies. The Newspaper Agency has an average daily production of about 730,000 papers and a Sunday production of 760,000 papers. The Agency employs 246 pressmen and 20 paper handlers to maintain a 24-hour operation. The normal workshift is seven hours per day, 35 hours per week. Generally, employees work four hours per week overtime during day shift and five hours per week overtime on a night shift. The peak activity is Wednesday (7:30pm - 4:00 am), Thursday (1:15pm - 9:00pm) and Friday (6:30am-4:00pm) due to the Sunday insert printing.

Employees are assigned two lockers for clean and dirty clothes. Uniforms are provided to workers and a laundry service for the employees is contracted. Hearing protectors are assigned to employees working in the press room or reel room, and protective gloves are supplied to employees handling the cleaning solvent (diesel oil).

The agency operates five presses (three in the old and two in the new press room). The press operating speed is measured in papers per hour and the size of the paper is determined by the number of printing units per press (ranges from 6-10 units per press). Four to five presses were operational during the survey. Although the presses can print 60,000 to 70,000 papers per hour they generally print about 45,000 -50,000 papers per hour.

Twelve to 15 workers are assigned to one press depending upon the size of the paper, and these workers' duties are as follows:

a) 1st operator - In charge of press operation. Operator spends his time at the folder checking the newspaper for quality, controlling column margins and adjusting the folder.

b) 2nd and 3rd operator - They perform all tasks of first operator and set ink.

c) Apprentice - Cleans the folder conveyor and maintains the crew's records.

d) Floorman - Floor supervisor, can perform any of the operators tasks but primarily checks quality of the newspaper.

e) Color man - Installs color plates onto printing units, fills and cleans color fountains, assists during press breakdown.

f) Reel man - Loads paper onto reel units, and assists press room as needed. One reel man is assigned per printing unit.

The newsprint rolls are loaded onto the reel units (three rolls per unit) in the reel room which is located below the press room. The paper (web) is fed to the press via guide rollers which thread the web to each printing unit. This standard letter press technique uses plastic plates, and the inks are a mineral oil base. Several ink colors are used in the printing units for advertisement purposes; however, the inks most commonly used other than black are red, blue and yellow. The inks are individually applied as the web passes through a special series of printing units called color decks. The black ink is pumped from underground storage tanks to the permanently installed ink fountains located at each printing unit. The colored inks are supplied to the ink fountains by five gallon hand carried buckets. An ink recovery system is installed on the presses to minimize airborne ink mist. After printing, the individual pages are automatically folded, assembled in proper sequence and conveyed to another location where the papers are counted, bundled and distributed to the carriers via a truck fleet.

A diesel oil is used to clean the presses and ink fountains after a color change. The portable fountains are cleaned in a tank located off the press room where they are air dried.

## IV. EVALUATION CRITERIA

### A. Environmental Criteria

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for assessment of a number of chemical and physical agents (Table A). These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy).

In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the evaluation criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increase the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: 1) NIOSH Criteria Documents and recommendations, 2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLV's), and 3) the U.S. Department of Labor (OSHA) occupational health standards. Often, the NIOSH recommendations and ACGIH TLV's are lower than the corresponding OSHA standards. Both NIOSH recommendations and ACGIH TLV's usually are based on more recent information than are the OSHA standards. The OSHA standards also may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH-recommended standards, by contrast, are based solely on concerns relating to the prevention of occupational disease. In evaluating the exposure levels and the recommendations for reducing these levels found in this report, it should be noted that industry is legally required to meet only those levels specified by an OSHA standard.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8- to 10-hour workday. Some substances have recommended short-term exposure limits or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from high short-term exposures.

TABLE A

| Substance | Time Weighted Average (TWA)a |
|---|---|
| Nuisance Dust* | ----- |
| Nuisance Dust (Cal-OSHA) | 10 $mg/m^3$b |
| Lead (NIOSH) | 0.05 $mg/m^3$ |
| Lead (Cal-OSHA) | 0.05 $mg/m^3$ |
| Mineral Oil Mist* | ----- |
| Mineral Oil Mist (Cal-OSHA) | 5.0 $mg/m^3$ |

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* There are no NIOSH recommended criteria for evaluating this airborne chemical contaminant.

a) TWA-NIOSH exposure is based on a workday up to 10 hours long, whereas the Cal-OSHA and ACGIH standard is based on an eight-hour workday.

b) $mg/m^3$ - milligrams of a substance per cubic meter of air.

A. Materials and Methods

1. Environmental

Twelve bulk paper samples were collected and analyzed for asbestos fibers. The samples were ashed in a low temperature asher and analyzed by transmission electron microscopy.

Six bulk ink samples (black, white, blue 51, red 52, yellow 53 and red 55) were submitted for qualitative metal analysis. Portions of the samples were weighed and ashed using nitric acid. The resulting solutions were analyzed by inductively coupled organ plasma atomic emission spectroscopy.

One bulk sample was analyzed for polynuclear aromatic hydrocarbons. An aliquat of the bulk was dissolved in a solvent (acetonitrile), filtered, evaporated and injected on a Vydac® reverse phase column.

Twelve environmental air samples were simultaneously collected for inorganic lead and total paper dust. Personal and general area air samples were collected using a MSA Model G. battery-operated pump with a polyvinyl chloride filter. Samples were collected at 1.5 liters per minute (lpm). The paper dust was determined by weighing the filter on a Perkin-Elmer® AD-2 electrobalance and subtracting the previously determined tare weights of the filters. Afterwards, the filters were analyzed for inorganic lead by NIOSH Physical and Chemical Analytical Method S-341[1]. The analytical limit of detection was three (3) micrograms per filter.

Fifty-four environmental air samples were collected for mineral oil mist and paper dust using a MSA vacuum pump operating at 1.5 lpm with a polyvinyl chloride filter. The paper dust weight was determined using the method described above. The ink mist samples were analyzed by NIOSH P&CAM No. 159[2]. The analytical limit of detection was 30 micrograms per filter.

2. Medical

The study was designed to compare the extent of respiratory symptoms and pulmonary function deficits between workers in the reel room, where the levels of paper dust and of printing inks are markedly less, and workers on the press deck, where these exposures are higher. In an industrial hygiene survey of a newspaper pressroom utilizing similar equipment, ink mist concentrations were found to be approximately four times greater for press room than for reel room workers (10).

A) Population sample: all pressmen working for SFNA in the old and new buildings were invited to participate in the study. The pressmen were classified by job title (fly man, apprentice, operator, journeyman, and foreman) and further by job group (journeyman versus all others combined, as the journeymen were the workers in the reel room area).

B) Questionnaire: the American Thoracic Society questionnaire on respiratory symptoms was amended to include questions relevant to the

work place factors under evaluation: work area, shift, job title, length of employment, building, and work-relatedness of several sub-sets of symptoms such as cough, phlegm, and chest illness, chronic bronchitis syndrome and breathlessness. Questions on diesel oil exposure and eye and skin irritation were also included. All workers participating in the study were individually administered the questionnaire by NIOSH medical staff.

C) Pulmonary function testing: height, weight, age and sex were determined for each worker. A minimum of three acceptable pulmonary function tests (criteria stated in reference #5) were obtained for each worker. Results were analyzed and classified as (a) percent of predicted FEV-1, (b) percent of predicted FVC, and (c) FEV-1 as percent of FVC, using the Knudson standard tables for predicted values; each of these terms is defined below.

Forced Expiratory Volume-1 (FEV-1): the maximum amount of air that can be expelled from the lungs in the first second after taking in a full breath. Expected values have been determined by testing healthy persons and depend on sex, age and height. Value are reported as percent of predicted (expected). Values below 70% indicate abnormal lung function, generally secondary to emphysema or restrictive lung disease.

Forced Vital Capacity (FVC): the total amount of air that can be expelled from the lungs after taking in a full breath. Expected values have been determined as for the FEV-1, and results are given as percent of predicted. Values below 70% are generally associated with emphysema or restrictive lung disease.

FEV-1/FVC: the ratio (expressed as a percent) of air expelled in one second to the total amount of air that can be expelled from the lungs. Values below 70% are usually associated with emphysema or obstructive disease.

The pulmonary function tests are only gross measurements of lung function and impairment of lung function may be present even when these values are all in the normal range.

Results for each individual were further classified according to the following definitions:

## TABLE B

### CLASSIFICATION OF PULMONARY FUNCTION TEST RESULT

| % PREDICTED FEV 1 | % PREDICTED FVC | FEV 1/FVC | CLASSIFICATION |
|---|---|---|---|
| Greater than or = 80% | Greater than or = 80% | Greater than or .70 | No abnormalities |
| Greater than or = 80% | Greater than or = 80% | Less than .70 | Obstructive |
| Greater than or = 80% | Less than 80% | Greater than or = .70 | Restrictive |
| Less than 80% | Greater than or = 80% | Greater than or = .70 | Obstructive |
| Less than 80% | Greater than or = 80% | Less than .70 | Obstructive |
| Less than 80% | Less than 80% | Greater than or = .70 | Restrictive or Obstructive |
| Less than 80% | Less than 80% | Less than .70 | Obstructive and Restrictive |

D) Statistical analysis: descriptive statistics of age, years of work as a pressman, years in this plant, and pulmonary function were generated. Based on their smoking history, workers were classified into current smoker, ex-smoker and non-smoker. The smoking differences among job titles, between job groups, among shifts, among work areas or among buildings were tested using a chi square test. Group prevalence differences for respiratory symptoms and pulmonary function abnormalities were tested with the adjustment of smoking differences, using linear model analysis.

## B. Toxicology

### 1. Occupational Hazards of Printing

While a number of studies have been done on the mortality experience (comparative death rates) of printers, very little has been done to study patterns of morbidity (illness, such as hearing loss, respiratory disease, dermatitis, etc.).

A) Morbidity among pressmen: noise, dermatitis (skin irritation and rashes), and back and leg problems are frequent complaints among pressmen. Excessive noise levels have been documented in many investigations of newspaper press rooms, and engineering controls have been developed specifically for these areas. A study of acute and subacute symptoms among commercial printers found significantly more eye, nose and throat irritation and neurological symptoms than among a control group. No difference in function was found between the two groups. Most of the symptoms were attributed to solvent exposure, which should not be a major exposure for newspaper pressmen (6).

B) Mortality among pressmen: several epidemiological investigations suggest that there is a cancer hazard associated with newspaper pressroom work. Because printing ink is the only major pressroom exposure currently recognized as a potential carcinogen, these studies are summarized in part (3) below.

2. Paper Dust

Paper dust is regulated as a nuisance dust with mild irritative effects on the eyes, nose and throat due to mechanical irritation and drying.

3. Printing Inks

Printing inks used in newspaper printing contain carbon black, mineral oil, and metal particulates. Carbon black and mineral oil exposures are measured as "ink mist", the primary health hazards of which would be irritation (skin, eye, and upper respiratory) and possible carcinogenesis. In one industrial hygiene study of a newspaper pressroom which utilized modern high speed presses with vacuum extraction to control ink mist concentrations, almost 80% by mass of the particles were large enough to be non-respirable, meaning that they are deposited in the nose, mouth and airway instead of being carried to the deeper reaches of the lung (7). This is consistent with a possible association between ink mist exposures and the observed excesses of lung and oral cavity cancer deaths among pressmen. Studies reported have found an excess of deaths from cancer of the lung and bronchus (8,9), from cancer of the oral cavity and from cirrhosis of the liver, and higher rate of emphysema at the time of death (10); an excess of deaths from leukemia and kidney cancer, and from cirrhosis of the liver(11); and an overall excess of mortality from all causes combined, due to an increase in deaths from cancer, non-infectious respiratory diseases, and cardiovascular disease (12). In the last study cited, non-infectious respiratory diseases were primarily emphysema and chronic obstructive pulmonary disease. Although smoking histories for the subjects were not available, the authors calculated the expected mortality experience if the study population were comprised of 20% more cigarette smokers than is typical for the general population; this could not account for any of the observed excesses except for cardiovascular and heart disease.

In summary, it appears that while the increased leukemia death rate may be due to past uses of benzene as a solvent, the relatively greater death rates for lung, oral cavity and kidney cancers may be due to factors which have not changed. In the study of New York City pressmen referred to above (1), analysis of subcohorts defined by decades of initial employment and compared at equal times from first employment did not reveal any significant trends, suggesting that the factors contributing to or responsible for the observed excess in mortality had not changed substantially during the first half of this century.

4. Diesel Oil

In use as a solvent to clean the presses, diesel oil is a health hazard primarily for its irritant and defatting (drying) effect on the skin.

## V. RESULTS AND DISCUSSION

### A. Environmental

Bulk paper and ink samples were collected and analyzed prior to the follow-up survey conducted February 27-29, 1980. Twelve bulk paper samples were analyzed for asbestos, but none was detected. Six bulk ink samples were qualitatively and semi-quantitatively analyzed for thirty-one metals. One ink (black) was analyzed for polynuclear aromatic hydrocarbons. Lead was the only significant metal identified in one of the inks (Red #52) at a level greater than one percent. No polynuclear aromatic hydrocarbons were detected in the bulk ink samples.

Personal and area air sampling was conducted during three work shifts which were judged by the employees to be the busiest work shifts. The presses were described by the press operators to be operating at normal speeds during the dates of this survey (see Table I).

Twelve personal breathing zone and general area air samples were collected for inorganic lead and paper dust (Table II). No lead was detected on the filters. The paper dust concentrations ranged from 0.27 - 2.41 $mg/m^3$. This is well below the CAL-OSHA standard of 10 $mg/m^3$.

Fifty- four personal breathing zone and general area air samples were simultaneously collected to measure ink mists as mineral oil mist and paper dust (Table III). The mineral oil mist concentrations ranged from 0.12 - 3.29 $mg/M^3$. None of these samples exceeded the CAL-OSHA standard of 10 $mg/M^3$.

Employees were observed cleaning the plate presses with diesel oil and not wearing protective gloves. Several employees were observed not wearing hearing protectors while working in the press area or reel room.

The electrostatic mist suppressors on the old presses were not operating during the dates of the survey.

There are four exhaust grills in the new press area and ten exhaust grills in the old press area (off side). Each grill has a rotating two ply ink mist filter that is automatically operated (New press area) or manually rotated by the machinist (Old press area). One filter in the new press area was not rotating properly and one exhaust grill was missing a filter.

AGE, YEARS AS PRESSMAN AND YEARS IN PLANT

| JOB TITLE | AGE N | AGE Mean | AGE S.D. | YEARS AS PRESSMAN N | YEARS AS PRESSMAN Mean | YEARS AS PRESSMAN S.D. | TOTAL YEARS IN PLANT N | TOTAL YEARS IN PLANT Mean | TOTAL YEARS IN PLANT S.D. |
|---|---|---|---|---|---|---|---|---|---|
| Journeyman | 65 | 46.6 | 10.8 | 65 | 25.1 | 9.5 | 65 | 13.2 | 7.2 |
| Apprentice | 17 | 30.2 | 6.4 | 17 | 7.5 | 2.5 | 17 | 6.7 | 2.3 |
| Flyman | 18 | 22.8 | 4.9 | 18 | 1.7 | 1.1 | 18 | 1.7 | 1.1 |
| Foreman | 11 | 47.4 | 10.6 | 12 | 29.5 | 9.6 | 12 | 15.6 | 6.7 |
| Operator | 75 | 42.7 | 10.7 | 77 | 22.9 | 10.8 | 77 | 14.0 | 8.8 |

Based on their smoking history, workers were classified into current smoker, ex-smoker and non-smoker. Smoking differences existed among job titles at the 0.05 level, but no smoking differences were found between job groups, among shifts, among work areas or among buildings (Table IV).

Due to the smoking differences among job titles, the group prevalence differences of the reported respiratory disorder symptoms such as cough, phlegm, wheezing, persistent cough and phlegm, persistent cough, phlegm and chest illness, chronic bronchitis syndrome and breathlessness were tested with the adjustment of smoking differences. Linear model analysis (Table V) with respiratory disorder symptoms as dependent variables one at a time and smoking, job title, area, shift and building as main effects were used. None but smoking effect was significant at the a=0.05 level; this was observed for the reported symptom, wheezing only, in which current smokers reported higher prevalence than ex- and non-smokers (74%, 32% and 30%, respectively).

Similar linear model analyses were repeated with replacement of job title with job group as one of the main effects. Smoking effect was significant for the reported symptoms, wheezing and cough; current smokers reported higher prevalence of grade 1 and 2 coughing and higher prevalence of wheezing. A work area effect was seen for the chronic bronchitis syndrome; pressroom workers reported symptoms of this significantly more frequently than reel room workers, after adjustment for smoking differences.

Descriptive statistics of age, years with press, total years with the plant and pulmonary function measures are given in Tables IV and V. Age was found to be significantly but weakly correlated with all three measures of pulmonary function ( r= - 0.15, -0.16 and -0.22 for FEV-1, FEV, and FEV-1/FVC respectively). Age differences existed among buildings, between shifts, and among job titles. Years with press, but not total years with the plant, was also significantly correlated to FEV-1/FVC (r = -0.21) and differences in mean number of years with press existed among groups. Analysis of covariance with age and press years as covariates, and smoking, job title or job group, area, building and shift as main effects was chosen to analyze for the pulmonary function measures. No group differences were observed after adjusting for the effects of age, years with press and smoking (also see Tables VI and VII).

Five pulmonary function outcomes -no abnormality, obstructive, restrictive, restrictive or obstructive, and restrictive and obstructive were derived from pulmonary function measures as described in section IV-B-2. Their distributions within press year groups ($<5$, 5-15, $>15$) or similar groups of total years with the plant were investigated and no differences were found. Their distributions among job titles, between job groups, among areas, among buildings, or between shifts showed no differences either.

Because the number of years worked in news pressrooms is so closely correlated with age for each individual, it is difficult to determine the independent effect of years with press. It should be noted that because age is used to predicted values for FEV-1 and FVC, correcting the results for age in the analysis as well may wash out some of the effect of years with press. A regression was performed comparing the additional variation explained by adding either age or years with press to the smoking effect as independent variables; years with press did not explain more variation than age.

Skin irritation and eye irritation were found in 40% and 42% of workers respectively. Although there was a greater extent of skin irritation among press room workers in comparison to reel room workers, both groups had high rates; it was not possible to distinguish the combined effects of paper dust, printing ink mist and diesel oil used to clean the presses.

## VI. CONCLUSIONS

In conclusion, employees working in the press room or reel room were not overexposed to asbestos, inorganic lead, ink mists or total nuisance dusts on the dates of this survey.

Press room workers had a significantly higher rate of reported chronic bronchitis syndrome symptoms than reel room workers, after adjustment for smoking history and age. Complaints of wheezing and cough were elevated among smokers in comparison to non-smokers, and were more prevalent among current smokers than ex- and non-smokers. Pulmonary function performance declined with age and years with press; these variables were so closely correlated that an independent effect for years with press could not be evaluated. Irritant dermatitis and eye irritation were associated with combined exposure to paper dust, printing ink mist, and diesel oil.

## VII. RECOMMENDATIONS

1. The folder vacuum grate should be cleaned at the beginning of each shift to facilitate paper dust collection.

2. Employees should be encouraged to wear hearing protectors when working in the press room or reel room.

3. Employees should be instructed to wear protective gloves when cleaning the press plates or ink fountains with diesel oil.

4. The automated rotating ink mist filtering system should be checked periodically to ascertain that it is working properly.

5. Employees should be educated about the potential interaction between smoking and press room exposures in causing or exacerbating chronic bronchitis syndrome.

6. Employees should receive employment/placement and yearly medical examinations including histories emphasizing the skin and respiratory system and pulmonary function testing (spirometry).

## VIII. REFERENCES

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## IX. AUTHORSHIP AND ACKNOWLEDGEMENTS


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## X. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22151. Information regarding its availability through NTIS can be obtained from the NIOSH Publications Office at the Cincinnati address.

Copies of this report have been sent to:

1. San Francisco Web Pressmen and Platemaker's Union No. 4.

2. San Francisco News Agency.

3. U.S. Department of Labor - Region IX.

4. California - Occupational Safety and Health Administration.

For the purpose of informing the affected employees, copies of the report shall be posted by the employer, in a prominent place accessible to the employees, for a period of 30 calendar days.

# T A B L E  I

PRESS OPERATING TIME AND SPEEDS

SAN FRANCISCO NEWS AGENCY
SAN FRANCISCO, CALIFORNIA

FEBRUARY 27-29, 1980

HETA 79-129

| | PRESS NO. | PAPERS PRINTED | PRESS OPERATING TIME (MIN.) | CALCULATED PAPERS/HOUR PRESS SPEED |
|---|---|---|---|---|
| 2/27-2/28/80<br>Wednesday Evening<br>Shift - 8:30pm - 3:00am | | | | |
| | 3 | 180,460 | 285 | ≈ 38,000 |
| | 5 | 160,950 | 206 | ≈ 47,000 |
| | 6 | 97,300 | 132 | ≈ 44,000 |
| | 7 | 120,600 | 138 | ≈ 52,000 |
| 2/28/80<br>Thursday Afternoon<br>Shift - 1:00pm - 9:30pm | | | | |
| | 6 | 229,960 | 314 | ≈ 44,000 |
| | 7 | 251,160 | 312 | ≈ 48,000 |
| 2/29/80<br>Friday Morning<br>Shift - 6:00am - 3:30pm | | | | |
| | 3 | 60,200 | 113 | ≈ 32,000 |
| | 5 | 127,190 | 245 | ≈ 31,000 |
| | 6 | 32,000 | * | Ranged |
| | 7 | 312,000 | * | 30,000-35,000 |

*Actual Operating time was not obtained because log not available; however, the press speed was estimated by the operators for their respective presses.

# TABLE I-I

SUMMARY OF AIR SAMPLING
FOR LEAD AND TOTAL NUISANCE DUST

SAN FRANCISCO NEWS AGENCY
SAN FRANCISCO, CALIFORNIA

FEBRUARY 27-29, 1980

HETA 79-129

| Date | Number | Sample | Job Classification or Location | Sampling Period | Sampling Volume (Liters) | Concentration ($mg/m^3$)[1] Lead | Concentration ($mg/m^3$)[1] Total Nuisance Dust |
|---|---|---|---|---|---|---|---|
| 2/27 | 6087 | P[2] | Press 6 - Apprentice | 2055-0310 | 510 | N.D.[3] | 0.31 |
| 2/27 | 6078 | A[4] | Between Press 6 & 7 | 2025-0310 | 518 | N.D. | 0.27 |
| 2/27 | 5247 | P | Press 3 - Apprentice | 2120-0300 | 510 | N.D. | 0.43 |
| 2/27 | 5253 | P | Press 5 - Apprentice | 2125-0305 | 510 | N.D. | 0.33 |
| 2/28 | 6083 | P | Press 6 - Apprentice | 1325-2015 | 638 | N.D. | 2.07 |
| 2/28 | 6094 | P | Press 7 - Apprentice | 1330-2018 | 462 | N.D. | 1.43 |
| 2/28 | 5762 | A | Between Press 6-7 | 1315-2025 | 735 | N.D. | 2.41 |
| 2/29 | 5261 | P | Press 7 - Apprentice | 0645-1330 | 540 | N.D. | 1.35 |
| 2/29 | 5262 | A | Between Press 6-7 | 0700-1620 | 630 | N.D. | 1.60 |
| 2/29 | 5742 | P | Press 5 - 3rd Man | 0825-1545 | 660 | N.D. | 0.57 |
| 2/29 | 5749 | P | Press 3 - 3rd Man | 1215-1545 | 315 | N.D. | 0.38 |
| 2/29 | 5755 | A | Press 3 - "off side" in front of exhaust grill | 1230-1545 | 293 | N.D. | 0.89 |

1. $mg/m^3$ - Milligrams of a substance per cubic meter of air.
2. P - Personal sample.
3. N.D. - None detected.
4. A - Area sample.

1. Lead - 0.05 $mg/m^3$.
2. Total Nuisance Dust - 10$mg/m^3$.

# TABLE III

SUMMARY OF PERSONNEL SAMPLING
FOR MINERAL OIL MIST AND TOTAL NUISANCE DUST

SAN FRANCISCO NEWS AGENCY
SAN FRANCISCO, CALIFORNIA

FEBRUARY 27-29, 1980

HETA 79-129

| Date | Sample Number | Job Classification or Location | Sampling Period | Sampling Volume (Liters) | Concentration ($mg/m^3$)[1] Mineral Oil Mist | Concentration ($mg/m^3$)[1] Total Nuisance Dust |
|---|---|---|---|---|---|---|
| 2/27 | 6079 | Press 6 - Operator | 2045-0310 | 525 | 0.38 | 0.49 |
| 2/27 | 6100 | Press 6 - 2nd Man | 2050-0310 | 488 | 0.43 | 0.49 |
| 2/27 | 6080 | Press 6 - 3rd Man | 2050-0310 | 510 | 0.35 | 0.39 |
| 2/27 | 6085 | Press 7 - Operator* | 2105-0310 | 495 | 0.24 | 0.44 |
| 2/27 | 6088 | Press 7 - 2nd Man | 2110-0310 | 540 | 0.44 | 0.54 |
| 2/27 | 6097 | Press 7 - Reel Man | 2110-0305 | 533 | 0.22 | 0.41 |
| 2/27 | 6084 | Press 7 - Reel Man | 2115-0305 | 525 | 0.36 | 0.63 |
| 2/27 | 6082 | Press 6 - Reel Man | 2120-0310 | 502 | 0.24 | 0.58 |
| 2/27 | 6092 | Press 6 - Reel Man | 2120-0310 | 525 | 0.28 | 0.55 |
| 2/27 | 5269 | Press 5 - 3rd Man | 2035-0305 | 495 | 0.12 | 0.28 |
| 2/27 | 5270 | Press 3 - 2nd Man | 2035-0300 | 489 | 0.89 | 0.74 |
| 2/27 | 5266 | Press 3 - 3rd Man | 2040-0300 | 453 | 0.26 | 0.46 |
| 2/27 | 5268 | Press 3 - Operator | 2040-0300 | 390 | 0.22 | 0.82 |
| 2/27 | 5265 | Press 5 - 2nd Man | 2040-0305 | 435 | 0.20 | 0.32 |
| 2/27 | 5259 | Press 5 - Operator | 2050-0305 | 450 | 0.20 | 0.31 |
| 2/27 | 5257 | Press 5 - Reel Man | 2105-0305 | 570 | 0.23 | 0.68 |
| 2/27 | 5250 | Press 5 - Reel Man | 2055-0305 | 555 | 0.27 | 0.47 |
| 2/27 | 5251 | Press 3 - Reel Man | 2100-0300 | 540 | 0.18 | 0.72 |
| 2/27 | 5260 | Press 3 - Reel Man | 2100-0300 | 540 | 0.30 | 0.72 |
| 2/28 | 6086 | Press 6 - Operator | 1445-2120 | 488 | 1.35 | 1.49 |
| 2/28 | 6090 | Press 6 - 2nd Man | 1320-2115 | 548 | 1.82 | 1.60 |

1. $mg/m^3$ - milligrams of substance per cubic meter of air.

*Filter torn when removed from cassette thus weight is slighly low.

1. Oil Mist, Mineral - 5 $mg/m^3$.
2. Total Nuisance Dust - 10 $mg/m^3$.

TABLE III (continued)

SUMMARY OF PERSONNEL SAMPLING
FOR MINERAL OIL MIST AND TOTAL NUISANCE DUST

SAN FRANCISCO NEWS AGENCY
SAN FRANCISCO, CALIFORNIA

FEBRUARY 27-29, 1980

HETA 79-129

| Date | Sample Number | Job Classification or Location | Sampling Period | Sampling Volume (Liters) | Concentration ($mg/m^3$)[1] Mineral Oil Mist | Concentration ($mg/m^3$)[1] Total Nuisance Dust |
|---|---|---|---|---|---|---|
| 2/28 | 6096 | Press 6 - Reel Man | 1340-1920 | 398 | 1.51 | 1.88 |
| 2/28 | 6081 | Press 6 - 3rd Man | 1335-2120 | 600 | 2.33 | 1.75 |
| 2/28 | 6091 | Press 7 - Operator | 1330-2110 | 578 | 1.73 | 2.04 |
| 2/28 | 6098 | Press 7 - 2nd Man | 1330-2110 | 495 | 2.62 | 1.88 |
| 2/28 | 6093 | Press 7 - 3rd Man | 1330-2115 | 623 | 1.13 | 1.03 |
| 2/28 | 6099 | Press 6 - Reel Man | 1330-2125 | 713 | 1.68 | 1.57 |
| 2/28 | 5758 | Press 7 - Reel Man | 1450-2000 | 345 | 0.67 | 1.07 |
| 2/29 | 5254* | Press 6 - Operator* | 0635-1400 | 608 | 2.80 | 4.24 |
| 2/29 | 5263 | Press 6 - 2nd Man | 0630-1400 | 608 | 2.63 | 1.69 |
| 2/29 | 5255* | Press 6 - Apprentice* | 0630-1400 | 608 | 3.29 | 3.85 |
| 2/29 | 5256 | Press 7 - Operator | 0650-1330 | 525 | 1.73 | 1.47 |
| 2/29 | 5264 | Press 7 - 2nd Man | 0705-1330 | 495 | 1.64 | 2.24 |
| 2/29 | 5267 | Press 7 - 3rd Man | 0655-1330 | 458 | 2.14 | 1.40 |
| 2/29 | 5258 | Press 6 - Reel Man | 0635-1405 | 615 | 1.23 | 1.12 |
| 2/29 | 5760* | Press 7 - Reel Man* | 0630-1330 | 540 | 0.46 | 0.52 |
| 2/29 | 5750 | Press 7 - Reel Man | 0700-1325 | 465 | 1.29 | 1.14 |
| 2/29 | 5753 | Press 6 - Reel Man | 0710-1405 | 570 | 0.81 | 1.05 |
| 2/29 | 5761 | Press 5 - Color Man | 0830-1545 | 483 | 0.58 | 0.72 |
| 2/29 | 5763 | Press 5 - 2nd Man | 0825-1545 | 660 | 0.47 | 0.57 |
| 2/29 | 5746 | Press 5 - Operator | 0830-1545 | 445 | 0.78 | 1.21 |
| 2/29 | 5751 | Press 5 - Reel Man | 0830-1435 | 390 | 0.24 | 0.69 |
| 2/29 | 5764 | Press 5 - Reel Man | 0830-1545 | 652 | 0.24 | 0.43 |
| 2/29 | 5744 | Press 3 - Operator | 1210-1545 | 315 | 0.38 | 3.94 |
| 2/29 | 5743 | Press 3 - 2nd Man | 1210-1545 | 315 | 0.27 | 0.54 |
| 2/29 | 5745 | Press 3 - Reel Man | 1220-1545 | 225 | 0.27 | 0.35 |
| 2/29 | 5747 | Press 3 - Reel Man | 1225-1545 | 218 | 0.42 | 0.78 |
| 2/29 | 5741 | Press 3 - Color Man | 1225-1550 | 308 | 0.68 | 0.65 |

# TABLE IV

SMOKING DIFFERENCES
AMONG GROUPS

SAN FRANCISCO NEWS AGENCY
SAN FRANCISCO, CALIFORNIA

HETA 79-129

| | Current Smoker | | Ex-Smoker | | Non-Smoker | | Total | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % |
| Job Title | | | | | | | | |
| Journeyman | 32 | 35.16 | 23 | 38.98 | 10 | 25.64 | 65 | 34.39 |
| Apprentice | 8 | 8.79 | 0 | 0.50 | 9 | 23.08 | 117 | 8.99 |
| Flyman | 9 | 9.89 | 7 | 11.86 | 2 | 5.13 | 18 | 9.52 |
| Foreman | 4 | 4.40 | 5 | 8.47 | 3 | 7.69 | 12 | 6.35 |
| Operator | 38 | 41.76 | 24 | 40.68 | 15 | 38.46 | 77 | 40.74 |
| TOTAL | 91 | 48.15 | 59 | 31.22 | 39 | 20.63 | 189 | 100.00 |

TABLE V

RESULTS OF LINEAR MODEL ANALYSES
FOR CATEGORICAL DATA:
SMOKING VS. RESPIRATORY EFFECTS
SAN FRANCISCO NEWS AGENCY
SAN FRANCISCO, CALIFORNIA

HETA 79-129

| EFFECT | FREQUENCY OF EFFECT* AMONG: CURRENT SMOKERS | EX-SMOKERS | NON-SMOKERS |
|---|---|---|---|
| Cough ** | 54.4% | 15.5% | 41.0% |
| Phlegm ** | 47.8 | 20.7 | 23.1 |
| Wheeze | 74.4 | 32.8 | 30.8 |
| Persistent Cough and Phlegm | 37.8 | 12.1 | 20.5 |
| Persistent Cough, Phlegm & Chest Illness | 6.7 | 1.7 | 5.1 |
| Chronic Bronchitis Syndrome | 8.9 | 3.4 | 2.6 |
| Pulmonary Function Test Results *** | 34.4 | 25.9 | 15.4 |

* Any effect was adjusted for other effects before performing $X^2$ test.

** $P<0.05$

*** Restrictive and/or obstructive defects.

# TABLE VI

DESCRIPTIVE STATISTICS OF AGE, PRESS YEARS
AND YEARS WITH THE PLANT BY GROUP

SAN FRANCISCO NEWS AGENCY
SAN FRANCISCO, CALIFORNIA

HETA 79-129

| | AGE | | | PRESS YEAR | | | TOTAL YEARS IN THIS PLANT | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | $\bar{x}$ | S.D. | N | $\bar{x}$ | S.D. | N | $\bar{x}$ | S.D. |
| Job Title | | | | | | | | | |
| Journeyman | 65 | 46.57 | 10.76 | 65 | 25.06 | 9.50 | 65 | 13.20 | 7.24 |
| Apprentice | 17 | 30.18 | 6.42 | 17 | 7.47 | 2.48 | 17 | 6.65 | 2.29 |
| Flyman | 18 | 22.78 | 4.80 | 18 | 1.72 | 1.07 | 18 | 1.72 | 1.07 |
| Foreman | 11 | 47.36 | 10.60 | 12 | 29.50 | 9.64 | 12 | 15.58 | 6.72 |
| Operator | 75 | 42.73 | 10.66 | 77 | 22.94 | 10.80 | 77 | 13.95 | 8.78 |
| TOTAL | 188 | 41.15 | 12.43 | 191 | 20.54 | 12.16 | 191 | 11.93 | 8.20 |

# TABLE VII

## DESCRIPTIVE STATISTICS OF PULMONARY FUNCTION MEASURES BY GROUPS

SAN FRANCISCO NEWS AGENCY
SAN FRANCISCO, CALIFORNIA

HETA 79-129

| | % PREDICTED $FEV_1$ | | | % PREDICTED FVC | | | $FEV_1$/FVC | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | $\bar{x}$ | S.D. | N | $\bar{x}$ | S.D. | N | $\bar{x}$ | S.D. |
| Job Title | | | | | | | | | |
| Journeyman | 64 | 96.65 | 21.59 | 64 | 105.41 | 16.59 | 64 | 72.65 | 10.56 |
| Apprentice | 17 | 105.99 | 15.86 | 17 | 109.97 | 13.35 | 17 | 78.38 | 6.75 |
| Flyman | 18 | 102.33 | 16.05 | 18 | 111.68 | 16.29 | 18 | 78.10 | 8.55 |
| Foreman | 12 | 107.86 | 13.76 | 12 | 115.57 | 12.84 | 12 | 74.41 | 6.47 |
| Operator | 74 | 103.21 | 17.42 | 74 | 107.74 | 14.66 | 74 | 76.68 | 8.57 |
| TOTAL | 187 | 101.45 | 18.63 | 187 | 108.08 | 15.33 | 187 | 75.45 | 9.20 |
| Job Group | | | | | | | | | |
| Journeyman | 64 | 96.65 | 21.59 | 64 | 105.41 | 16.59 | 64 | 72.65 | 10.56 |
| Others | 121 | 103.93 | 16.58 | 121 | 109.45 | 14.61 | 121 | 76.91 | 8.13 |
| Area | | | | | | | | | |
| Reel Room | 58 | 96.27 | 22.20 | 58 | 105.08 | 16.88 | 58 | 72.44 | 10.56 |
| Press Deck | 108 | 102.92 | 17.03 | 108 | 108.96 | 15.07 | 108 | 76.47 | 8.31 |
| Both | 19 | 108.94 | 11.99 | 19 | 111.88 | 11.07 | 19 | 79.11 | 7.80 |