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HEALTH HAZARD EVALUATION DETERMINATION
Report No. 77-69-522

CHICAGO TRIBUNE
CHICAGO, ILLINOIS

AUGUST 1978

## I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) on May 3-4, 1977 and September 29-30, 1977, in the pressrom of the Chicago Tribune, Chicago, Illinois. Fifteen pressroom employees were interviewed by NIOSH investigators. Personal and general area atmospheric samples were taken for: total ink mist, oil mist, trace metals (lead, chromium, nickel and cadmium), black ink oil (polynuclear aromatic classification), benzidine, 3,3' - dichlorobenzidine and paper dust. Based on the results of the environmental investigation and currently available information regarding toxicity of newspaper printing inks, it could not be demonstrated that inhalation of ink mist and paper dust at the concentrations found in the Chicago Tribune Pressroom posed a health hazard at this time to presently exposed pressroom employees. However, it is emphasized that current knowledge and understanding of the toxicity of printing inks is limited. In view of the unusual mortality experienced by newspaper pressmen for cancer of the buccal cavity and pharynx,[17 18] it would be prudent to reduce pressmen exposure to ink mist as much as possible.

## II. DISTRIBUTION AND AVAILABILITY

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

Copies of this report have been sent to:

a) Chicago Tribune Co., Chicago, Illinois
b) Authorized Representative of Employees Chicago Web Pressman's Union No. 7
c) International Printing and Graphic Communications Union
d) U. S. Department of Labor - Region V

e) NIOSH Region V

For the purpose of informing the 350 affected employees, copies of the report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.

## III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S. C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The National Institute for Occupational Safety and Health received such a request from the Business Representative for the Chicago Web Pressmans Union No. 7 on behalf of the Pressmen, Jr. Pressmen and Apprentice Pressmen working in the Chicago Tribune Pressroom. The requestor had stated that employees were concerned about "immediate and future health problems" and "respiratory dangers" from their exposures to airborne ink mist.

## IV. HEALTH HAZARD EVALUATION

### A. Description of Process

The Chicago Tribune has an average daily circulation of 750,000 newspapers and 1,155,000 Sunday papers. The Tribune operates 25 presses which are arranged as "press lines" containing up to 6 presses of various size and configurations. The operating speed of each press is measured in papers per hour and the size of the paper is determined by the number of printing units used in each press. The presses are operated on a staggered two shift schedule, 7.5 hours per day and 7 hours per night. Peak activity occurs during Wednesday and Friday from 7:00 a.m. to 5:30 p.m. and during night shift on Saturday until 5:00 a.m. Sunday. During peak activity, operation of all 25 presses is not required.

Fourteen to 16 persons are assigned to operate one press. The large newsprint rolls are loaded onto the press in the reelroom which is located directly below the pressroom. The paper or "web" is fed into the press via a system of guide rollers which thread the "web" through a series of printing units. The paper is printed using a standard letter press technique and all inks are oil base. Many different ink colors are used in the printing units for special color advertising; however, the red, yellow and blue inks account for the bulk of color ink consumption. These colors are applied separately by running the "web" through a

special series of printing units called a "colordeck". Black printing ink is piped directly from bulk storage tanks to permanent installed ink fountain which are located in each printing unit. Colored inks are supplied to portable fountain by hand carried buckets and tanks. Approximately 8-9 million pounds of black ink and 350,000 pounds of colored inks are consumed each year. After printing, the "web" feeds into the folder machine for final assembly into newspapers.

The solvent used for cleaning presses, portable fountains and ink buckets is kerosene. The apprentice pressmen with the least seniority are assigned the responsibility for clean up. The portable fountains are cleaned in a large solvent tank located in the ink room. Ink buckets are kerosene-rinsed in the pressroom from a large open can or drum located near press #27. The cans are then dried with rags. The clean up men observed were not wearing protective clothing or gloves.

Pressmen reported that a press run on presses #22-26 generated the greatest amount of ink mist, especially when running the color decks and portable ink fountains. Presses #1 - 6 and #27 are equipped with ink demisters. The demister is a combination fiber filter/exhaust fan which is located in the reelroom, mounted below each printing unit. The demister is a metal canister containing a hollow cylindrical filter pad which rotates at 3600 RPM. Ink mist is drawn into exhaust ducts located inside the housing of the printing unit by means of the small centrifugal fan which is attached to the rotating filter. Ink is collected on the filter and the excess ink is thrown onto the inside wall of the metal canister where it is captured and drained into a small plastic storage bottle. The colordecks above the pressroom floor were not equipped with ink demisters.

B. Evaluation Design and Study Progress

1. Initial Survey

An initial survey was conducted on May 3 - 4, 1977. NIOSH investigators were given a walk-through tour of the pressroom and reelroom by company and union representatives. Fifteen pressroom employees were given non-directed confidential interviews to determine if they had experienced health problems or had noted symptoms which, in their opinion, had resulted from their exposure to ink mist or other toxic substances used or released in the pressroom environment. Bulk samples of black, red, yellow, blue and green printing ink were taken for possible subsequent laboratory analysis.

A literature search was conducted to review past and recent studies regarding occupational health hazards and illness associated with the newspaper printing industry. Newspaper

printing ink formulation information was obtained from The National Association of Printing Ink Manufacturers, Harrison, New York and from the printing ink suppliers.

Because of the complaints among pressmen concerning the "intolerable" amount of ink mist and paper dust in the pressroom, an in-depth follow-up environmental investigation was planned.

2. Follow-up Survey

The follow-up survey was conducted by NIOSH investigators during September 29-30, 1977. Personal and area atmospheric samples were collected for total ink mist, roller lube oil mist, trace metals (used in certain color ink pigments), black ink oil and benzidine and 3,3' dichlorobenzidine (used in the manufacture of benzidine yellow pigment). Paper dust was collected and analyzed for total weight, trace metal contamination and asbestos content. The asbestos analysis was performed to alleviate the concern of several pressmen who suspected that the paper dust might contain asbestos.

Exposure to kerosene vapors during clean-up was not evaluated. A discussion regarding kerosene toxicity is included in Section IV D of this report.

C. Evaluation Methods

Individual time-weighted average (TWA) exposures to total ink mist and airborne trace metals were evaluated by collecting samples using air sampling equipment worn by the pressmen. Ink mist was collected on pre-weighed PVC filters having a pore size of 5.0 microns. Trace metals were collected on 0.8 micron methyl cellulose ester filters. Each filter was individually contained in a 37mm diameter 3 piece plastic cassette. The two cassettes, were attached to the pressman's shirt collar. An air flow rate of 1.5 liters per minute through the filter was maintained using battery operated air sampling pumps clipped to the pressman's belt. Area samples of high ink mist concentrations in the immediate vicinity of operating printing units were also taken. Although area samples indicate the relative amount of ink mist escaping from a printing unit, the results from area samples were not considered as representative of a pressman's exposure. Total ink mist analyses were obtained by a gravimetric (post-sample weighing) method. Trace metals (lead, chromium, nickel and cadmium) determinations were performed using NIOSH P&CAM #173 (atomic absorption spectro-photometry).[1]

Oil mist generated during lubrication of ink rollers on a printing unit running a dry fountain was sampled for a short term duration as both a personal sample and an area sample. Total mist (ink and lub oil) was determined gravimetrically and the lub

oil mist fraction was determined by a fluorescence spectrophotometric analysis. The oil mist analysis was performed following P&CAM #159, except that standards were prepared and samples were extracted with carbon tetrachloride instead of chloroform.[2]

Four area samples for ink mist (black ink oil fraction containing petroleum pitch) were collected from printing units running black ink. The ink mist was collected on fiber glass/silver membrane filters and the samples were analyzed by extracting the filters with cyclohexane. A portion of the extract was dried and weighed for the determination of cyclohexane solubles. The extract remaining was then analyzed for six different polynuclear aromatic hydrocarbons (PNA's): benzo-a-pyrene (BaP), anthracene, pyrene, chrysene, benzo-e-pyrene (BeP), and fluoranthene. The analyses were performed using a high pressure liquid chromatograph (HPLC). The limit of detection was 0.02 micrograms ($\mu$g)/sample for BaP; 0.03 $\mu$g/sample for anthracene, pyrene and chrysene; and 0.025 $\mu$g/sample for BeP and fluoranthene.

Yellow ink mist (containing benzidine yellow pigment) released from the color decks on press #4, 5, 22, 24, 25 and 27 was sampled by drawing a known volume of air through a sampling train consisting of a fiber glass filter and a silica gel tube back up connected in series. Two personal samples and 6 area samples were collected in this manner. The filters and silica gel tubes were desorbed with a solution of triethylamine in methanol and analyzed for total benzidine and total 3,3' - dichlorobenzidine using a HPLC. A detection limit of 1 $\mu$g/sample (fiber glass filter only) was established for both benzidine and 3, 3'-dichlorobenzidine. The analyses were performed using NIOSH P&CAM #246 and #243.[3]

One personal sample and 1 area sample for paper dust released from a folder machine on press #24 and from a folder on press #3 were collected on pre-weighed DM 800 filters. The filter cassettes were attached to the shirt collar of the "Packer" or directly on the folder machine. The filters were analyzed for total paper dust gravimetrically. The filters were then analyzed for lead, chromium, nickel and cadmium using NIOSH P&CAM #173 (atomic absorption spectrophotometry).[1] A bulk sample of accumulated paper dust taken from the framework of the folder was also analyzed for the above trace metals. The limit of detection for lead was 4 $\mu$g per sample and for chromium, nickel and cadmium, 2 $\mu$g per Sample.

A bulk sample of paper dust was also analyzed for asbestos using phase contrast and polarizing techniques. Two atmospheric area samples of paper dust were collected on cellulose ester membrane filters mounted in 37 mm open face cassettes. Analyses of the air samples were accomplished using a phase contrast microscope.

D. Evaluation Criteria

The most frequently used criteria for evaluating the health risks for newspaper pressmen exposed to airborne ink mist is the Threshold Limit Value (TLV) for oil mist (mineral oil) recommended by the American Conference of Governmental Hygienists (ACGIH). The current ACGIH TLV for oil mist is 5 milligrams per cubic meter of air ($mg/M^3$) based on an 8 hour time weighted average (TWA).[4] This level is also the current permissible exposure limit enforced by the Occupational Safety and Health Administration (OSHA) in accordance with the Federal Occupational Safety and Health Standards (29CFR Part 1910-1000). However, when using only the oil mist criteria, the investigator must make the assumption that the most hazardous substance contained in newspaper ink is the mineral oil component. Although mineral oil is the major component in newspaper printing inks it is more likely that the ink pigments and additives would contain toxic substances more hazardous than mineral oil.

1. Printing Ink Formulations

The approximate formulation for the printing inks evaluated in this study are outlined below:

Black Ink - (Pattern ink formula type 103 letter press ink)

| | |
|---|---|
| Pigment - carbon black | 10%-12% |
| Oils - black ink oil (70% petroleum pitch 30% kerosene) | 3%-5% |
| - naphthenic mineral oils | 81%-83% |

Red Ink - (pattern ink formula type 101 or 102)

| | |
|---|---|
| Pigment - Phloxine (lead containing pigment) | 11% |
| Oils - petrolatum | 6% |
| - high boiling mineral oils | 83% |

Blue Ink

| | |
|---|---|
| Pigments - peacock blue (organic) | 25% |
| -phthalo cyanine blue | 2% |
| Oil. - petrolatum | 6% |
| - mineral oil | 67% |

Yellow Ink

| | |
|---|---|
| Pigment - AAA benzidine yellow | 8% |
| Oils - petrolatum | 6% |
| - mineral oil | 86% |

2. Toxicity of Printing Ink Components

Oil Mist (mineral) - For the most part oil mists present a low order of toxicity. Inhalation of mineral oil mist in high concentrations may cause pulmonary effects, although this has rarely been reported. Certain additives or thermal decomposition products may cause mild eye or upper respiratory irritation but these effects have not been fully evaluated experimentally.[5] The current ACGIH TLV for oil mist is 5 mg/M³ for an 8 hour TWA and 10 mg/M³ as a short term exposure limit (15 minute duration).

Carbon Black - Studies with laboratory animals have demonstrated that benzene extracts of carbon black are carcinogenic. Repeated administration of the benzene - extractable fraction of carbon black caused tumors in several species of animals by ingestion, skin contact or subcutaneous or intraperitoneal injection in oil. However, similar exposures to carbon black were not carcinogenic; moreover, it has been demonstrated that carbon black will actually adsorb known carcinogens and prevent their tumorigenic action. There are currently no well demonstrated health hazards associated with human exposure to carbon black.[6] The TLV for carbon black recommended by the ACGIH is 3.5 mg/M³ TWA. (Note: Occupational exposure to carbon black was not directly evaluated during this survey because the NIOSH laboratory could not distinguish the carbon black component from other organic compounds contained in black printing ink).

Inorganic Lead (component of phloxine red pigment) - Lead is a natural occuring element that can be absorbed by the body through inhalation and ingestion. Absorption of excessive quantities of lead causes lead poisoning. The symptoms of lead poisoning include general ill-feeling,fatigue, headache, nervousness, muscle and joint pains, and disturbance of sleep. Chronic lead poisoning can cause damage to the liver kidneys and central nervous system. The current Federal standard for lead and its inorganic compounds is 0.2 mg/M³ . TWA? The proposed lead standard and NIOSH revised recommendation would limit airborne lead exposure to 0.1 mg/M³ as determined by an 8 hour TWA.

Peacock Blue - This is an organic pigment of low toxicity.

Phthalocyanine Blue - This substance is not considered to possess hazardous properties.

Benzidine Yellow - Benzidine yellow is one of a family of organic pigments prepared by coupling the trazonium salt of 3,3'-dichlorobenzidine with acetoacelarylides. Benzidine and 3,3'-dichlorobenzidine are both known to cause bladder cancer in humans. However, The National Cancer Institute has completed the Bio-Assay on benzidine yellow and has concluded that this substance has not been shown to be carcinogenic.[8] Animal studies with other benzine derived dyes (direct blue 6, direct black 38, direct brown 45) can be metabolized by the body to the original

free benzidine.[9] Benzidine yellow pigment apparently does not metabolize in this manner. There is no Federal standard or ACGIH TLV for benzidine yellow.

3. Other Substances Evaluated

Paper Dust - The paper dust most frequently encountered in the Chicago Tribune Pressroom is the paper dust fallout generated from the folder machines. It has been shown[10 11] that printed newspapers may contain varying amounts of hazardous metals such as lead, chromium and cadmium. However, the folder machine paper dust is actually the small flakes of paper which are created when cutter bars chop the folded sheets into individual newspapers. This chopping action occurs between printed sections of the paper and the actual dust is mostly non-printed paper free of trace metal contamination. The paper dust is biologically inert but excessive concentration could reduce visibility or cause unpleasant deposits in the eyes, ears, and nasal passages.[5] The ACGIH TLV for nuisance dust is 10mg/M$^3$ as total dust based on an 8 hour TWA.

Kerosene - Kerosene is a refined petroleum solvent that has a boiling range of 209-274° C. This solvent is a mixture of petroleum hydrocarbons, with carbon chain lengths that range from C9 to C16 carbon atoms per molecule. Synonyms for kerosene include astral oil, coal oil, and No. 1 fuel oil. Kerosene liquid may produce primary skin irritation as a result of defatting. Aspiration of the liquid may cause extensive pulmonary injury. Kerosene mist may also cause mucous membrane irritation. Inhalation of high concentrations of kerosene vapor may cause headache, nausea, confusion, drowsiness, convulsions, and coma. Presently there is no Federal standard for kerosene vapor exposure.[13] NIOSH recommends that exposure to kerosene be controlled so that no worker is exposed at a concentration greater than 100 mg/M$^3$ as a TWA based on a 10 hour work shift, 40 - hour work week.[12]

E. Evaluation Results

1. Employee Interviews

A summary of the results from the confidential employee interviews conducted during the initial survey is presented in Table 1. Fifteen employees were interviewed. Many of the complaints and health problems reported were not associated with ink mist exposure.

2. Environmental Survey

The atmospheric samples were collected near the presses listed on Table 2. The pressruns recorded for those presses on the days

atmospheric samples were collected (September 29-30) are also presented in Table 2.

The environmental findings are presented in Table 3, Total Ink Mist; Table 4, Total Mist and Roller Lub Mist (press #27); Table 5, Trace Metals; Table 6, Black Ink Oil Mist Analyses; Table 7, Benzidine and 3,3' - dichlorobenzidine; and Table 8, Paper Dust Analyses. Only one personal sample (VM-36) exceeded 5 mg/M$^3$, the evaluation criteria for oil mist. The excessive oil mist collected on the area samples was expected in view of the locations chosen for sampling. Oil mist combined with ink mist during roller lubrication on press #27 generated excessive mist exposure for the pressman performing the roller lubrication. Personal exposures to airborne trace metals were below levels which would be considered health hazardous. Special atmospheric sampling and analysis of black ink did not detect the presence of selected polynuclear aromatic hydrocarbons (several PNA's have been identified as known or suspected carcinogens). The bladder carcinogens, benzidine and 3,3' - dichlorobenzidine were not detected in the atmospheric yellow ink mist samples. The concentration and composition of the airborne paper dust was not considered health hazardous for pressroom employees.

F. Discussion

Traditionally the problem of ink mist in the pressroom has been considered more of a nuisance than a health hazard. The environmental findings of this survey tend to support that conclusion. Although two pressmen were exposed to ink mist in excess of the evaluation criteria, the 5 mg/M$^3$ TLV and 10mg/M$^3$ STEL do not represent a fine line between safe and hazardous ink mist exposure levels. The ACGIH established the 5 mg/M$^3$ TLV for oil mist more as a housekeeping standard than a health standard. It must also be pointed out that the oil mist TLV may not be an appropriate evaluation criteria for a study concerned with the determination of the health hazard associated with ink mist exposure.

Environmental and epidemiological studies conducted by Golstein [14,15] et al. have shown that newspaper pressmen working in areas with ink mist concentrations 2 to 4 times the 5 mg/M$^3$ TLV showed no apparent acute or chronic health effects. On the other hand, mortality data from a recent study by Lloyd[16] et al. has shown that newspaper pressmen experience an unusual incidence of cancer of the buccal (cheek) cavity and pharynx which is experienced in the early and middle working years. NIOSH recently completed a retrospective survey of cancer in relation to health[17] and found that the relative risk of developing buccal cavity and pharynx cancer was 2.33 for print workers. This increased risk was considered statistically significant (p less than 0.05).

It is important to note that previous studies by Lippmann[14] and Goumas[18] were mainly concerned with measuring only the respirable ink mist fraction (ink mist droplets less than 3 microns in diameter), since non-respirable droplets (droplets larger than 3 microns) would not pass through the upper respiratory tract and be deposited in the lower respiratory passageways of the lung. The droplet size of pressroom ink mist will range between 9-30 microns.[14] Therefore, when collecting only the respirable ink mist fraction it is understandable that samples will contain only small quanities of ink (results well below the 5mg/M$^3$ TLV for oil mist).

A review of the literature[15] [16] indicates that newspaper pressmen do not experience an increased risk of lung cancer. It is possible that because newspaper pressroom ink mist is composed of droplets which are too large to be deposited in the lungs, pressmen exposed to the ink mist do not develop lung cancer at a rate higher than average.

In conclusion, environmental studies of newspaper pressroom ink mist should be concerned with evaluation of the total mist concentration as well as pressmen's exposure to printing ink through direct contact or occasional ingestion. Whether the excess mortality of newspaper pressmen from buccal cavity and pharynx cancer is due to occupational or non-occupational factors has not been determined. Such a determination is beyond the scope of this study. The current limitations of the toxicological information available on printing inks, the lack of an established and valid evaluation criteria for making a determination as to what would be considered a health hazardous concentration of airborne ink mist, and the unusual incidence of cancer of the buccal cavity and pharynx experienced by newspaper pressmen, demonstrates the need for an effective effort toward minimizing exposure to ink mist.

G. Recommendations

1. Precautions should be taken to minimize exposure of the pressmen to ink mist generated by the operating presses. Improved printing unit enclosures (especially older units) and greater exhaust air volumes on currently or newly installed ink demisters should be considered.

2. Pressmen should wear the disposable single use mist masks when servicing operating printing units.

3. Pressmen who frequently come in contact with inks should be cautioned and instructed to thoroughly wash their hands before smoking or eating.

4. The kerosene used near press #27 for cleaning ink buckets should be stored in an approved fire-resistant safety container equipped with a self-closing lid.

5. Clean-up men should be provided appropriate protective clothing such as gloves and aprons which are resistant to kerosene in order to limit their direct skin contact. Gloves should be of adequate size and length to prevent kerosene from entering at the cuff, and should have some type of washable or changeable lining to reduce sweating of the hands.

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Table 1
Chicago Tribune
April 4, 1977
Initial Survey Employee Interview Results

| Symptom Reported | Number Reporting Symptom | | |
|---|---|---|---|
| | Work Related | Non-Work Related | Total |
| hemorrhoids | 0 | 3 | 3 |
| chronic coughing | 1 | 0 | 1 |
| coughing phlegm | 4 | 0 | 4 |
| slips and falls | 2 | 0 | 2 |
| asthma | 0 | 1 | 1 |
| acute bronchitis | 0 | 1 | 1 |
| tired | 2 | 0 | 2 |
| back problems | 2 | 1 | 3 |
| hearing problems | 3 | 0 | 3 |
| heart attack | 0 | 1 | 1 |
| kidney infection | 0 | 1 | 1 |
| overweight | 0 | 1 | 1 |
| diabetes | 0 | 1 | 1 |
| paper dust complaints | 4 | 0 | 4 |
| no complaints | N/A | N/A | 2 |

Total Interviewed: 15

| | |
|---|---|
| 9 | Pressmen |
| 4 | Jr. Pressmen |
| 1 | Apprentice Pressmen |
| 1 | Machinist |

Several employees reported more than 1 symptom.

Table 2
Chicago Tribune
September 29 and 30, 1977
Press Operation Data

September 29, 1977

| Press Operating | Start Times - Stop Times | Personnel Assigned |
|---|---|---|
| #2 (printing main sheets)<br>max. speed 50,000 papers/hr. | 10:02 am - 12:00 noon<br>12:49 pm - 3:30 pm | 14 Pressmen (6 in reelroom)<br>1 Packer |
| #4 (printing supplement parts)<br>max. speed 50,000 paper/hr. | 8:28 am - 11:55 am<br>1:00 pm - 3:25 pm | 14 Pressmen (6 in reelroom)<br>2 Packers |
| #5 (printing main sheets)<br>max. speed 50,000 papers/hr. | 10:04 am - 11:25 am<br>1:00 pm - 3:30 pm | 13 Pressmen (6 in reelroom)<br>1 Packer |
| #22 (printing supplement parts)<br>max. speed 42,000 papers/hr. | 8:30 am - 11:55 am<br>1:00 pm - 2:53 pm | 14 Pressmen (6 in reelroom)<br>2 Packers |
| #24 (printing supplement parts)<br>max. speed 42,000 papers/hr. | 8:32 am - 11:55 am<br>1:00 pm - thru next shift | 14 Pressmen (6 in reelroom)<br>2 Packers |
| #25 (printing supplement parts)<br>max. speed 42,000 papers/hr. | 8:37 am - 11:55 am<br>1:00 pm - 3:25 pm | 14 Pressmen (6 in reelroom)<br>2 Packers |
| #23 (printing supplement parts)<br>max. speed 42,000 papers/hr. | 8:43 am - 11:53 am<br>1:00 pm - 2:55 pm | 14 Pressmen (6 in reelroom)<br>2 Packers |

September 30, 1977

| | | |
|---|---|---|
| #3 (printing main sheets)<br>max. speed 50,000 papers/hr. | 10:10 am - 11:45 am | 14 Pressmen (6 in reelroom)<br>2 Packers |
| #27 (printing supplement parts)<br>max. speed 45,000 papers/hr. | 8:36 am - 11:55 am<br>1:00 pm - thru next shift | 13 Pressmen (5 in reelroom)<br>2 Packers |
| #24 (printing supplement parts)<br>max. speed 42,000 papers/hr. | 8:33 am - 11:55 am<br>1:00 pm - thru next shift | 13 Pressmen (5 in reelroom)<br>2 Packers |
| #22 (printing supplement parts)<br>max. speed 42,000 papers/hr. | 8:47 am - 11:55 am<br>1:00 pm - thru next shift | 13 Pressmen (5 in reelroom)<br>1 Packer |

Table 3
Chicago Tribune
September 29-30, 1977
Ink Mist (as total mist)
Atmospheric Sampling Results

| Sample Location | Sample No. | Sample Time | Sample Volume (liters) | Ink Mist mg/M³ |
|---|---|---|---|---|
| | September 29, 1977 | | | |
| Pressman, Press #4 | VM-31 | 0939-1506 | 506.9 | 3.6 |
| " " #2 | VM-32 | 0947-1515 | 508.4 | 1.0 |
| Colorman, " #5 | VM-33 | 0951-1514 | 484.5 | 2.2 |
| " " #24 | VM-34 | 0956-1507 | 478.9 | 1.9 |
| Offside Man, " #24 | VM-35 | 0958-1507 | 479.0 | 3.0 |
| Pressman, " #22 | VM-36 | 0959-1507 | 462.0 | 6.2 |
| Colordeck area, Press #22 | VM-37 | 1015-1312 | 260.2 | 43. |
| Printing unit #22, Press #4 | VM-38 | 1009-1530 | 471.9 | 21. |
| Colordeck area, Press #24 | VM-39 | 1013-1321 | 291.4 | 21. |
| " " " " #24 | VM-42 | 1324-1536 | 204.6 | 20. |
| | September 30, 1977 | | | |
| Printing #130, Press #2 | | | | |
| Above time board, opposite | VM-54 | 0956-1435 | 410.1 | 1.6 |
| printing unit #110 | VM-55 | 0947-1445 | 461.9 | 3.1 |
| Above fire extinguisher, between | | | | |
| Press #25 and #20 (upper deck) | VM-56 | 1311-1440 | 133.5 | 3.4 |

Evaluation Criteria: 5mg ink mist/M³. time weighted average, as recommended by the ACGIH in 1977 as a TLV for oil mist (white mineral oil).

Newspaper printing inks are approximately 70%-80% high boiling mineral oil.

Table 4
Chicago Tribune
September 30, 1977
Total Mist and Roller Lub Oil Mist
Atmospheric Sampling Results

| Sample Location | Sample No. | Sample Time (short term) | Sample Volume (liters) | Total Mist $mg/M^3$ | Lub Oil Mist $mg/M^3$ |
|---|---|---|---|---|---|
| Pressman performing roller lubrication, Press #27 | VM-57 | 1317-1332 | 21.75 | 14.7 | 6.5 |
| Printing unit #29, press #27 | VM-58 | 1318-1333 | 22.05 | 5.9 | 3.7 |

Evaluation Criteria: $10mg/M^3$ oil mist = short term exposure limit as recommended by the ACGIH in 1977 as a TLV for oil mist (15 minute exposure).

Note: Total mist is both ink mist and mist generated during printing unit #29 roller lubrication.

Table 5
Chicago Tribune
September 29-30, 1977
Trace Metals in Ink Mist
Atmospheric Sampling Results

| Sample Location | Sample No. | Sample Time | Sample Volume (liters) | Trace Metals Lead mg/M³ | Chromium mg/M³ | Nickel mg/M³ | Cadmium mg/M³ |
|---|---|---|---|---|---|---|---|
| | | | Personal Samples | | | | |
| Pressman, press # 4 | AA-1 | 0939-1506 | 490.5 | ND | ND | ND | ND |
| Pressman, press # 2 | AA-2 | 0947-1515 | 492.0 | ND | ND | ND | ND |
| Offside Man, press # 24 | AA-3 | 0958-1507 | 460.4 | ND | ND | ND | ND |
| Pressman, press # 22 | AA-4 | 0959-1507 | 477.4 | 0.02 | ND | ND | ND |
| | | | Area Samples | | | | |
| Colordeck, press #22 | AA-5 | 1015-1312 | 274.4 | 0.20 | ND | ND | ND |
| " " " " | AA-10 | 1317-1541 | 223.2 | 0.38 | ND | ND | ND |
| Print unit 22, press # 4 | AA-6 | 1009-1530 | 494.3 | 0.01 | ND | ND | ND |
| Colordeck, press # 24 | AA-7 | 1013-1321 | 289.5 | 0.29 | ND | ND | ND |
| " " " " | AA-11 | 1324-1536 | 203.3 | 0.15 | ND | ND | ND |
| Colordeck, press # 23 | AA-8 | 1017-1517 | 450.0 | 0.03 | ND | ND | ND |

Evaluation Criteria: 0.1 mg. of lead/M³, 8 hour time weighted average as recommended March, 1977 by NIOSH during testimony at the OSHA hearings on the proposed standard for occupational exposure to lead.

ND = Not detected. Airborne trace metals sampled were not present in concentrations which could be detected through laboratory analysis. Limit of detection reported by the laboratory was:
4.4 micrograms lead per filter
2.2 micrograms chromium per filter
10.6 micrograms nickel per filter
0.33 micrograms cadmium per filter

Note: Red newspaper printing ink contains Phloxine, a lead based red pigment.

Table 6
Chicago Tribune
September 29-30, 1977
Atmospheric Sampling Results for Black Ink Oil (containing petroleum pitch)

| Sample Location | Sample No. | Sample Time | Sample Volume (liters) | Cyclohexane Solubles mg/M³ | Organic Classification for Selected PNA's* BaP | Ant | Pyr | Chr | BeP | Flu |
|---|---|---|---|---|---|---|---|---|---|---|
| Printing unit 25, Press #5 | AG-41 | 1033-1531 | 444 | 0.27 | ND | ND | ND | ND | ND | ND |
| Printing unit 20, Press #4 | AG-42 | 1034-1529 | 439.6 | 1.96 | ND | ND | ND | ND | ND | ND |
| Printing unit 110, Press #24 | AG-43 | 1031-1535 | 456 | 3.55 | ND | ND | ND | ND | ND | ND |
| Printing unit 129, Press #27 | AG-45 | 1003-1427 | 393.4 | 1.32 | ND | ND | ND | ND | ND | ND |

Evaluation Criteria: No occupational health standard or TLV has been established for petroleum pitch. NIOSH recommends 5.0 mg/M³ 8 hour time average for occupational exposure to asphalt fumes which can be considered synonymous to petroleum pitch.

ND= None Detected.

*PNA's = Polynuclear aromatic hydrocarbons. These substances are high molecular weight polycyclic hydrocarbons. Several PNA's have been identified as potential carcinogens.

BaP = benzo-a-pyrene
Ant = anthracene
Pyr = pyrene
Chr = chrysene
BeP = benzo-e-pyrene
Flu = fluoranthene

Table 7
Chicago Tribune
September 29-30, 1977
Atmospheric Sampling of Yellow Ink Mist for
Benzidene and 3,3' - dichlorobenzidene

| Sample Location | Sample No. | Sample Time | Sample Volume (liters) | benzidene | 3,3' - dichlorobenzidene |
|---|---|---|---|---|---|
| Colorman, Press #5 | FG/SG-1 | 0951-1514 | 461.9 | ND | ND |
| Colorman, Press #24 | FG/SG-2 | 0956-1507 | 444.7 | ND | ND |
| Colordeck, Press #24 | FG/SG-3 | 1035-1538 | 430-3 | ND | ND |
| Colordeck, Press #25 | FG/SG-5 | 1036-1332 | 252.6 | ND | ND |
| " " " " | FG/SG-7 | 1335-1539 | 177.9 | ND | ND |
| Colordeck, Press #4 | FG/SG-4 | 1037-1532 | 423.3 | ND | ND |
| Near Press # 22 opposite colordeck | FG/SG-8 | 0950-1443 | 416.1 | ND | ND |
| colordeck, press #27 | FG/SG-9 | 1001-1483 | 397.5 | ND | ND |

ND = Not Detected

Note: Yellow newspaper printing ink contains diarylide yellow AAA, a benzidine derived pigment. Benzidine and dichlorobenzidine are two known bladder carcinogens. Although these substances were not found in the yellow printing inks, animal studies have demonstrated that certain benzidine derived dyes may be metabolized by the body to the original free benzidene. However, benzidene yellow pigment apparently does not metabolize in this manner.