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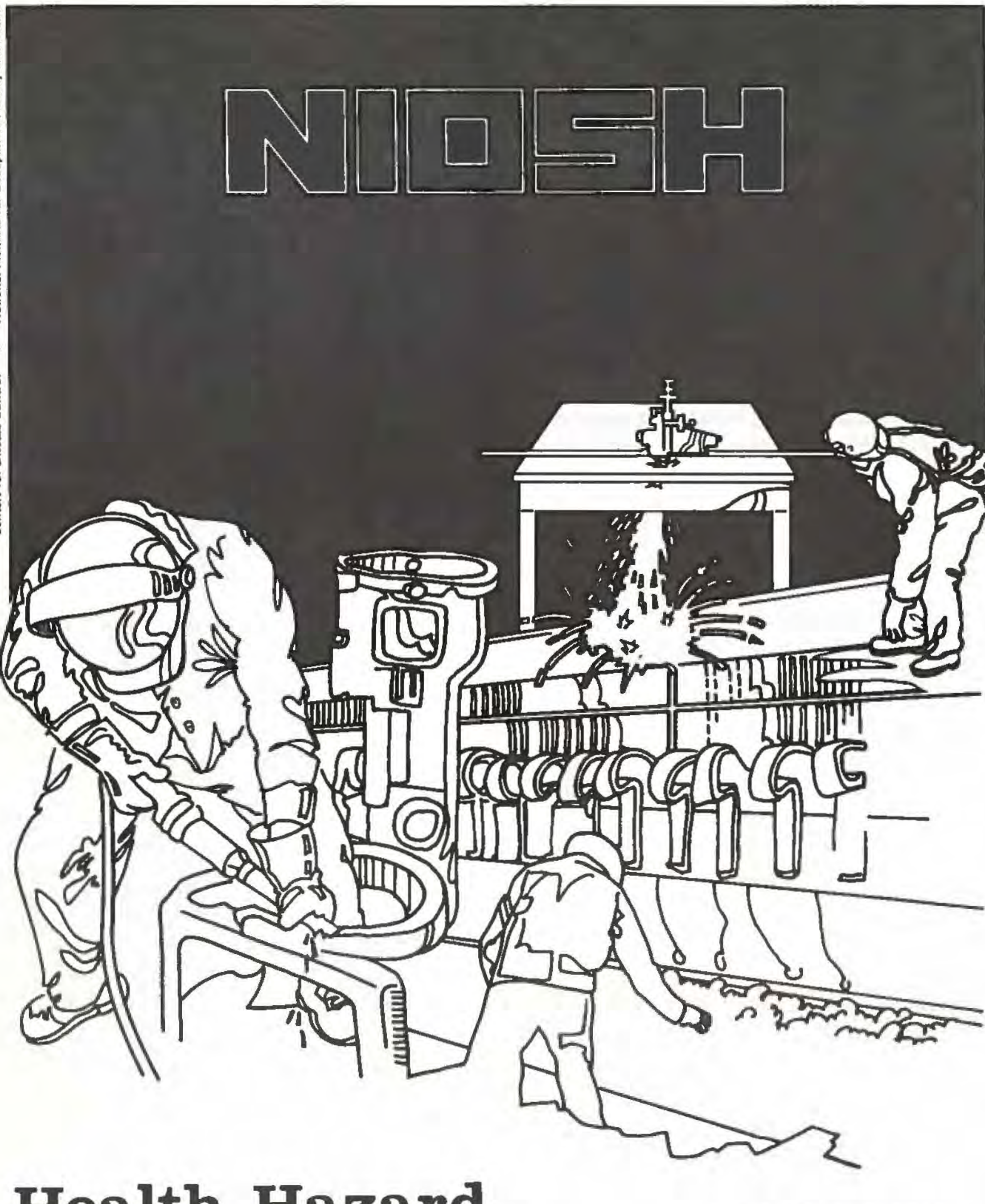

Health Hazard Evaluation Report

HETA 80-146-1044
NEW YORK POST
NEW YORK, NEW YORK

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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NEW YORK POST
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I. SUMMARY

On May 23, 1980, The National Institute for Occupational Safety and Health (NIOSH) received a request from an authorized representative of employees to conduct a health hazard evaluation in the newspaper composing room of the New York Post, 210 South Street, New York, New York. The request was prompted by the typographical workers' concern about the chemicals with which they work and about possible exposure to radiation generated by the video display terminals (VDTs). NIOSH was asked to identify the chemicals used in the composing room, to describe their potential toxic properties and to determine the degree of radiation hazard to operators from the VDTs in the composing room and the computer center. During the radiation survey, an additional request was made to evaluate radiation exposures from VDTs in the city room.

A walk-through survey of the composing room was made on June 6, 1980, and various employees were interviewed. The only chemical exposures were from substances used by 30-40 workers to develop photographs. The chemicals were identified, their toxicity summarized, and relevant exposure limits identified. The major potential result of exposures was development of dermatitis, mainly from skin contact with acids and bases. However, use of gloves and good personal hygiene seemed adequate to prevent the problem since there were no complaints of dermatitis among those interviewed. Small amounts of formaldehyde were used, but no changes in control technology were indicated.

On January 12, 1981, 17 of approximately 54 VDTs in use by the New York Post were surveyed for emissions of X-rays, radiofrequency radiation (electric and magnetic field strengths), and ultraviolet radiation. X-rays above background levels, magnetic fields or ultraviolet radiation were not found. Electric fields found were of low intensity, and were not confirmed by supplementary measurements.

NIOSH concludes that no health hazards from photographic chemicals or from radiation from video display terminals currently exist for employees in the composing and city rooms and the computer center of the New York Post.

KEYWORDS: SIC 2711 (Publishing and Printing Newspapers) video display terminals (VDTs), photograph developing

II. INTRODUCTION

On May 23, 1980, The National Institute for Occupational Safety and Health (NIOSH) received a request from an authorized representative of employees to conduct a health hazard evaluation in the newspaper composing room of the New York Post, 210 South Street, New York, New York. The request was prompted by the typographical workers' concern about the chemicals with which they work and possible exposure to radiation generated by the video display terminals (VDTs) used in the composing room and in the computer center. NIOSH was asked to identify the chemicals used in the composing room, to describe their potential toxic properties and to determine the degree of radiation hazard to operators from the VDTs. During the radiation survey, an additional request was made to evaluate radiation exposures from VDTs in the city room.

III. BACKGROUND

In a well lighted, ventilated, 40'x120' room, copy, including text, photographs, headlines, etc., is arranged on mock-up sheets of the pages of newspaper on slant-board work benches. The average daily newspaper is 75-100 pages. Five to seven editions are prepared daily, requiring the composition of different sections (late news, stocks, etc.). In total, approximately 200 pages may be composed in a typical day (two shifts). The composing room uses no linotypes or lead in any form. After the sheets are composed, they are photographed. The photographs are developed in adjacent darkrooms and then sent to be processed into offset printing plates. The only chemicals used in the composing room are those involved in developing photographs. About 150 people work in the composing room, of whom 30 to 40 are directly involved in developing photographs.

In its total operation, the New York Post uses about 54 VDTs for word processing applications. Such terminals are very similar to a black and white television set and contain a source of electrons and a phosphor-coated screen with a specially designed picture tube (cathode ray tube). The cathode or electron gun releases a narrow beam of electrons which is accelerated by high voltage to the anode or phosphorescent screen. The beam scans the screen at fixed, predetermined rates, horizontally and vertically. The interaction of electrons with the phosphor changes the electrons' kinetic energy into light. The viewed image is produced by modulating the number of electrons in the electron beam in response to an incoming electrical signal.

VDTs may produce several types of electromagnetic radiation, depending upon operating characteristics. Low energy X-rays may be generated by the cathode ray tube and electronic damper circuits. Certain electronic components and circuits may produce radiofrequency (RF) radiation. Ultraviolet (UV), visible, and infrared (IR) radiation may be emitted from the screen face, depending on the phosphor used. To perform a complete radiation survey, several instruments are required to measure the different radiation types which may be emitted by the VDT.

IV. METHODS

The Regional Industrial Hygienist met with representatives of the New York Post management and the New York Typographical Union #6 on June 6, 1980. A walk-through survey of the composing room was performed and various employees were interviewed.

Radiation surveys were conducted by NIOSH on January 12, 1981 at 17 terminals selected by the union steward. Four of these were in the composing room, three were in the computer center, and ten were in the city room which includes classified, sports, and editorial areas.

Two instruments were used in the x-ray survey. A Stoms meter[1] was employeed to rapidly locate any x-ray beams generated by the terminal and a Victoreen Model 440 RF/C was available to accurately measure x-ray emissions in case any were detected with the Stoms meter.

The Stoms instrument is specifically designed to easily locate small diameter, low energy x-ray beams down to 12-13 kiloelectron volts (keV), but it is not used for quantitative measurement of X-rays. It was designed by the Bureau of Radiological Health, Food and Drug Administration, for use in monitoring the federal television receiver performance standard of 0.5 milliroentgens hour (mR/hr) (21CFR 1020.10). It uses four Victoreen Model 1B85 Geiger-Mueller tubes as the detectors and is calibrated electronically with a Tektronix Model 7603 oscilloscope and a pulse generator. The meter reads out in counts per minute (cpm). A reading of 3,000-4,000 cpm is roughly equivalent to 0.5 mR/hr. Every accessible surface of the VDT was slowly scanned with the Stoms meter as close to the surface as possible and at least four background measurements were taken in each area or room where VDTs were located.

The Victoreen Model 440 RF/C is specifically designed to measure x-ray emissions from TV receivers and is shielded against electromagnetic interference. The maximum x-ray energy radiating from VDT terminals is approximately 15-20 keV, depending on the operating voltage of the cathode ray tube. These radiations can be monitored by the Victoreen Model 440 RF/C which responds adequately in the range of 6 to 42 keV. Exposure rates as low as 0.05 mR/hr can be measured and the overall accuracy is about ± 15 percent.

RF electric field strength measurements were taken with Holaday instruments. A Model HI-3001 meter (S/N 26004) was used with two probes, green (S/N 014), and red (S/N 015) to measure the electric field strength in volts squared per meter squared (V^2/m^2). The probes were calibrated on September 14, 1980. The minimum detectable limit for the green probe was 5 V^2/m^2 and for the red probe it was $5x10^3$ V^2/m^2. The maximum detectable field strength for the green probe was 10^4 V^2/m^2 and for the red probe it was 10^7 V^2/m^2. The overall accuracy of both probes was ± 2.0 dB, corresponding to +59 and -37 percent, in the frequency range of 0.5 to 1,000 MegaHertz (MHz).

For RF magnetic field strength measurements the Narda Model 25540 meter (S/N 04022) and Narda Model 8633 probe (S/N 01005), calibrated May 30, 1980 were used. The minimum detectable limit is 0.1 amperes squared per meter squared. (A^2/m^2) and the overall probe accuracy is $\pm$2.5 dB, corresponding to +78 and -44 percent, in the range of 10 to 300 MHz.

Irradiance in the near UV wavelength range between 320 and 400 nanometers (nm) was measured with an International Light Model IL730 Actinic Radiometer and PT171C probe with attached filter and diffuser. The instrument reads out in watts per centimeter squared (W/cm^2). The minimum detectable level is $5x10^{-8}$ W/cm^2 and the accuracy is about $\pm$20 percent. All measurements with this instrument were made at contact with the VDT screen face.

V. EVALUATION CRITERIA

For photographic chemical exposures, relevant Occupational Safety and Health Administration (OSHA) standards (29CFR 1910.1000), NIOSH recommended standards[2], and American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV's)[3] are presented in Table 1.

Radiation exposure limits are summarized in Table 2.

The OSHA standard (29CFR 1910.96) for ionizing radiation is 2.5 mR/hr, averaged over a 40-hour workweek.

The OSHA radiation protection standard (29CFR 1910.97) for occupational exposure to RF radiation applies to frequencies in the range of 10-100,000 MHz. It limits occupational exposures to a maximum power density of 10 milliwatts per centimeter squared (mW/cm^2), averaged over any possible 6-minute period. In the far field, a mean squared electric field strength of 40,000 V^2/m^2 and a mean squared magnetic field strength of 0.25 A^2/m^2 are equivalent to a power density of 10 mW/cm^2. At present, there is no standard for frequencies below 10 MHz.

NIOSH[4] recommends an exposure limit of 1 mW/cm^2 for near UV radiation.

Vl. RESULTS AND DISCUSSION

Photographic Chemicals

The only exposure to chemicals was in the development of the photographs. The chemicals, as used in the composing room, were in solution. A list of the chemicals used, their relevant environmental exposure limits, and their toxic properties are presented in Tables 1, 3, and 4. The potential chemical hazards associated with the composing-room operation are similar to those that might be found at a small to medium sized photograph developing studio. Based on a consideration of the type and amounts of chemicals used in the composing room, exposure to air-borne contaminants is considered to be minimal. The major health risk in a photograph developing operation of this size is dermatitis. The fixing and developing solutions are alternately acidic and basic and may produce skin irritation upon contact. The use of gloves, personal hygiene and general ventilation are usually sufficient to control hazards in such a laboratory with moderate work load. The employees interviewed had no physical complaints (including dermatitis) related to their work environment. Most employees do not work with any hazardous chemicals, and those that do (30-40 developers) have only moderate exposure to potential dermatitis-producing solutions. Because of the use of protective gloves and good personal hygiene, dermatitis has not been a problem at this composing room.

Video Display Terminals

Four types of video display terminals used by the New York Post, Harris Models 1720, 1740, 2200, and Burroughs, were evaluated.

The Harris 2200 Model is used in the composing room. This model operates at a potential of 18 keV, uses a P-31 phosphor and has a metal case.

Harris Model 1740 video display terminals are used in the computer room and in the sports area of the city room. Two Harris Model 1720 sets used in the city room were included in the survey. Both models (1740 and 1720) operate at a potential of 15 keV, and use a high contrast enhancement P-31 phosphor which is identified as a PC-110.

The Burroughs VDTs, used in the classified news area, operate at 12 to 18 keV potential, use a P-39 phosphor and have plastic cases with a zinc metal like interior coating. The phosphor, according to the Joint Electron Device Engineering Council[5], emits radiation only in the visible wavelength range.

Table 5 lists the terminals surveyed, their locations, the parts of the terminals from which radiation was detected, and the type of radiation measured at that particular part.

Typical background readings for X-rays were in the 20-100 cpm range. All meter readings for X-rays emanating from the VDTs were well within this range (Table 5).

In the RF range, measurements of electric field strength were obtained, but magnetic fields, if present, were below the detection capability of the instruments. As shown in Table 5, the electric field strengths were extremely low and were found emanating only from the screen, back and left side (when facing the terminal). No radiation of any type was found emanating from the right side and the top of any of the 17 terminals surveyed.

Because this was the first field use of the Holaday instruments, and since electric-field measurements were found, it was considered necessary to make a field comparison of the new instrument with a type of instrument that had been used in previous field studies. Since the New York Times had such instrumentation (Narda) and used Harris Model 1740 VDTs, they graciously agreed to allow us to make comparative measurements.

The New York Times furnished a Narda meter with a Narda probe Model 8644 (S/N 02048), calibrated December 22, 1980. Its minimal detectable limit was 2,000 V^2/m^2 with an overall accuracy of +1.5 dB to -3.5 dB, corresponding to +41% and -55%, in the frequency range of 10 to 3,000 MHz.

The comparative results are presented in Table 6.

The low levels of electric field radiation detected at the Times, using the Holaday meter, were similar to those found at the New York Post. However, no radiation was detected at the Times using the Narda instrument. This could possibly be explained by the detection frequencies of the instruments. The Holaday range for detection is as low as 0.5 MHz whereas the Narda range has a lower limit of 10 MHz.

An information bulletin[6] distributed later by the Holaday Industries advised users not to attempt to measure electric field strengths around video display terminals with this instrument. Because of the electronic design of the instrument, false readings result that cannot be related to meaningful values. Mr. Holaday, in a personal communication, opined that the instrument would have the tendency to read on the high side in measuring low frequencies, but he had no data to support his contention.

No UV radiation was found, as would be expected from the spectral characteristics of the phosphors.

VII. CONCLUSIONS

Most of the chemicals used for developing black and white photographs have been in general usage for 75 years and are considered relatively innocuous at the low exposure concentrations found in developing photographs. These processes do not use the relatively more hazardous dyes encountered in processes used for developing color photographs. Many of the photographic chemicals can produce dermatitis on contact with the skin. Although several hundred "sheets" are developed daily at this newspaper, the chemical exposure is of moderate degree. With the use of gloves and good personal hygiene, dermatitis has not been a problem, and no complaints of other health effects were disclosed during interviews with the employees.

Since the chemical hazard evaluation was conducted in 1980, information has become available that formaldehyde may have potential as a human carcinogen and NIOSH recommends that exposures to this chemical be kept as low as feasible[7]. Since only a small amount of formaldehyde is used in the process, no changes of control technology for the New York Post are indicated.

All measurable radiation (Table 5) was exceedingly low when compared with the current occupational standards (Table 2). X-radiation above background levels, detectable magnetic field strengths, and UV radiation were not found.

Electric field strength measurements found with the Holaday instrumentation were well below the federal standard and their existence was not confirmed when comparative measurements were made with the Narda instrument. Therefore, NIOSH concludes that employees of the New York Post working with or near VDTs are not subjected to hazardous radiation exposures. This finding is consistent with the findings of NIOSH in previous studies [8-11] of radiation exposures from VDT terminals.

In conclusion, NIOSH found no evidence of health hazards from photographic chemicals or radiation from VDT terminals that require corrective action.

VIII. REFERENCES

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X. DISTRIBUTION AND AVAILABILITY

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Technical Information Branch, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After ninety (90) days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia 22161. Information regarding its availablility through NTIS can be obtained from the NIOSH Publications Office at the Cincinnati, Ohio address.

Copies of this report have been sent to:

1. New York Typographical Union, 817 Broadway, New York, NY 10003

2. N.Y. Post, 210 South St., New York, NY 10278

3. U.S. Department of Labor, OSHA, Region II

4. N.Y. State Department of Health

5. U.S. Department of Health and Human Services, NIOSH, Region II

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

Table 1. Exposure Limits for Chemicals used in Photographic Processing
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CHEMICAL	EXPOSURE CRITERIA		REFERENCE
	CONCENTRATION	TYPE	
o-Dihydroxybenzene (resorcinol)	10 ppm	TWA	ACGIH[3]
p-Dihydroxybenzene (hydroquinone)	2 mg/m3	8-hr TWA	OSHA*
Formaldehyde	2 ppm	ceiling	ACGIH[3]
	3 ppm	8-hr TWA	OSHA*
	5 ppm	ceiling	OSHA*
	As low as feasible		NIOSH[7]
Mercury	0.05 mg/m3	TWA	ACGIH[3]
	0.1 mg/m3	ceiling	OSHA*
	0.05 mg/m3	8-hr TWA	NIOSH[2]
Acetic acid	10 pp	8-hr TWA	OSHA*
Ammonia	25 ppm	TWA	ACGIH[3]
	50 ppm	8-hr TWA	OSHA*
	50 ppm	ceiling (5 min)	NIOSH[2]
Iodine	0.1 ppm	ceiling	OSHA*
Hydrogen peroxide	1 ppm	8-hr TWA	OSHA*
Alkali cyanides	5 mg/m3	8-hr TWA	OSHA*
(skin absorption)	5 mg/m3	ceiling (10 min)	NIOSH[2]
Sulfuric acid	1 mg/m3	8-hr TWA	OSHA*

ppm = parts of contaminant per million parts of air
mg/m3 = milligrams of contaminant per cubic meter of air
TWA = time weighted average
* =OSHA Standards, 29CFR 1910.1000

Table 2. Comparison of Maximum Measured Radiation
With Current Exposure Limits
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Radiation Region	Units	Maximum Radiation	Exposure Limits	Reference
X-ray	mR/hr	Background	2.5	29CFR 1910.96§
Radiofrequency				
Electric field	V^2/m^2	ND*	40,000#	29CFR 1910.97§
Magnetic field	A^2/m^2	ND	0.25#	29CFR 1910.97§
Ultraviolet				
(Near)	mW/cm^2	0.65	1	NIOSH[4]

* ND = not detectable
\# Far-field equivalent of 10 mW/cm^2
§ OSHA Standard

Table 3. Chemicals Encountered in Photographic Processing and their Uses
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CHEMICALS	USES
p-Methylaminophenol, p- and o-dihydroxybenzene, trihydroxybenzene, p-hydroxyphenylaminoacetic acid, 1-phenyl-3-pyrazolidone, p-aminophenol	Black-and-white developing agents
Sodium carbonate, borax, potassium carbonate, sodium tetraborate, sodium hydroxide	pH Adjusters, accelerators
Benzotriazole, 6-nitrobenzimidazole nitrate, potassium bromide, sodium bromide	Restrainers, anti-foggants
Sodium bisulfite, potassium metabisulfite	Preservatives, pH adjusters
Sodium thiosulfate (hypo)	Fixing agent
Sulfuric acid, potassium aluminum sulfate, sodium aluminum sulfate, acetic acid	Hardners, pH adjusters, preservatives
Ammonia, hydrogen peroxide, potassium permanganate, sodium hypochlorite, iodine, potassium perborate	Hypo eliminators
Mercuric chloride, mercuric iodide, silver nitrate, potassium cyanide, potassium bichromate, hydrochloric acid	Intensifiers
potassium ferricyanide/potassium bromide mixture	Bleaching agents
Citrazinic acid, ethylenediaminetetraacetic acid	Contrast control agents
Potassium thiocyanate	Silver solvent
Formalin (40% formaldehyde)	Hardener, stabilizer
Sodium sulfite	Intensifier, preservative, pH Adjuster

Table 4. Toxic Effects of Exposure to Photographic Chemicals
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1.	p-Dihydroxybenzene (hydroquinone)	Irritation of eyes, nausea, dizziness
2.	o-Dihydroxybenzene (resorcinol)	Dermatitis, respiratory tract irritation
3.	Dimethyl-p-phenylenediamine	Dermatitis, respiratory tract irritation
4.	Formaldehyde	Eye, nose & throat irritation, pulmonary irritation, dermatitis, potential carcinogen
5.	Hydroxylamine hydrochcloride	Dermatits, eye, gastrointestinal & respiratory tract irritation
6.	Hydrogen peroxide	Dermatitis, eye, gastrointestinal & respiratory tract irritation
7.	Acetic acid	Eye, nose & throat irritation, dermatitis, coughing
8.	Iodine	Dermatitis, eye, nose & throat irritation, headache, vomiting
9.	Ammonia	Dermatitis, eye, nose and throat irritation, pulmonary edema
10.	Inorganic mercury compounds	Central nervous system involvement tremor, forgetfullness
11.	Potassium permanganate	Dermatitis, eye, respiratory tract & gastrointestinal irritation
12.	Bromine compounds	Dermatitis, headache, eye, nose & throat irritation
13.	Sulfuric acid	Dermatitis, eye, nose & throat irritation

Table 5. New York Post Measurements
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Measurement Identification			Electric Field Strength (V^2/m^2)		
Manufacturer and Model	Instrument Number*	X-Rays CPM	Screen	Back	Left side
		Composing Room			
Harris 2200 (metal case)	1335	40-100	ND	ND	ND**
	1336	40-100	ND	ND	ND
	1337	40-100	ND	ND	ND
	1338	40-100	ND	ND	ND
		Computer Center			
Harris 1740 (plastic case)	05-150	40-100	ND	ND	600
	05-151	40-100	ND	ND	600
	05-192	40-100	30	ND	700
		City Room, Classified Section			
Burroughs (plastic case)	05	40-100	300-500	1,000	ND
	10	40-100	300-500	1,000	ND
	11	40-100	300-500	1,000	ND
	17	40-100	300-500	1,000	ND
	19	40-100	250	1,000	100
		City Room, Sports Section			
Harris 1740 (plastic case)	24	40-80	ND	ND	750
	33	20-100	ND	ND	350
		City Room, Editorial Section			
Harris 1720 (plastic case)	05-199	20-80	ND	ND	300-500
	1140	20-80	ND	ND	300-500
Harris 1740 (plastic case)	1145	20-80	ND	ND	500
		All Areas			
Background		20-100			

* Serial or company
** Not detected

Table 6. New York Times Measurements
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Measurement Identification		Electric Field Strength (V^2/m^2)			
		Holaday		Narda	
Manufacturer and Model	Instrument Number*	Screen	Side	Screen	Side
Harris (1740)	00-003	300	1600	ND**	ND
Harris (1740)	02-101	25	750	ND	ND
Harris (1740)	06-712	70	750	ND	ND

* Serial or Company
** Not detectable

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