U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION REPORT
NO. HE 79-105-687

RCA CORPORATION
MARION, INDIANA

MAY 1980

I. SUMMARY

In May, 1979, the National Institute for Occupational Safety and Health (NIOSH) received a request from the International Brotherhood of Electrical Workers for a health hazard evaluation of the RCA Corporation located in Marion, Indiana. The request alleged that employees working in Slurry Rooms 1, 3, 6, and 9 were exposed to substance(s) that were causing hair discoloration. NIOSH responded by conducting a preliminary screening survey June 27th and 28th, 1979. Environmental samples were obtained along with personal information concerning the affected employees. Resulting data indicated increased levels of cadmium fumes, of trichloroethylene vapors and of an oxidizing or bleaching agent.

On October 31 and November 1, 1979, NIOSH conducted a follow-up evaluation of Slurry Rooms 1, 3, 6, and 9. Long-term sampling techniques were incorporated to determine time-weighted average concentrations of cadmium and trichloroethylene. Since the hair color changes were most likely the result of a bleaching agent(s), swab tests were obtained from shelves, tabletops, and employees' gloves, fingers, and scalp hair. In addition, bulk samples of protective film solutions were collected to determine the presence of an oxidizing agent(s), particularly hydrogen peroxide (H_2O_2).

Analysis of all charcoal tube and filter samples indicated no aluminum, iron, zinc, magnesium, cadmium, isopropanol or trichloroethylene overexposures. Hydrogen peroxide (H_2O_2) was detected. Levels of 160 ppm (H_2O_2 by volume) were detected at the panel cleaning (film application) station, decreased to less than 5 ppm when moving 12 feet either side of this station, and further decreased to <1 ppm beyond 15 feet of the film application area.

On the basis of the data obtained in the investigation, NIOSH has determined that a hazard from overexposure to aluminum, iron, zinc, magnesium, cadmium, isopropanol and trichloroethylene did not exist at the time of the health hazard evaluation. However, the hydrogen peroxide found in the screen cleaning solution (5 to 6%) is of great enough strength to cause hair color changes; 3 to 6% solutions are generally used in homes and beauty shops for simple hair bleaching.[1]

Recommendations have been incorporated into the body of the report as a guide for the control of increased H_2O_2 exposures resulting from screen cleaning processes.

II. INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) received such a request from the International Brotherhood of Electrical Workers, Local #116, on May 30, 1979. The request alleged that employees working in the final red phosphor slurry application areas (Rooms 1, 3, 6, and 9) were exposed to substance(s) that were causing hair discoloration. The request did not identify particular substance(s) that were potential causes for the hair color changes.

III. HEALTH HAZARD EVALUATION

A. Facility Description

RCA Picture Tube Division, a subsidiary of RCA Corporation, is located on a 56-acre site in Marion, Indiana. Production at this site began in 1949 and has expanded in size to a plot of 19 buildings and a work force of 487 administrative and 2,441 production personnel. Active medical, safety, and industrial hygiene programs, with professionals available full-time as well as on an on-call basis, are utilized by plant management.

Of particular concern at the plant were the slurry screening rooms (slurry application areas). The total work force in the slurry application areas consists of approximately 60 persons of which 25 reported hair discoloration problems. In these areas green, blue, and red phosphor slurries are applied to diagonal panels, dried and inspected. During processing, slurry materials, a combination of polyvinyl alcohol (PVA) and minor ingredients, are applied by dispensers to panels and spun to assure an even coating. The panels are then conveyed to heaters and spun for drying. From the heating units the panels are delivered mechanically through various cleaning and drying phases. After drying, a mask is placed on the panel in preparation for lighthouse exposure. The exposing process is essentially photographic in that ultraviolet light sources, special lenses, and filters are arranged to direct light onto the screen, thus exposing the phosphor materials. Succeeding lighthouse exposure, the panel is rinsed to remove excess slurry and dried. Prior to the panel leaving the slurry room, a thin layer of protective film is applied and an inspection is made (under an ultraviolet light) of the panel for approximately 25 different defects. It should be noted that each color is applied on the screen in separate steps with green being first, followed by blue and red.

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 an employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

B. Evaluation Methods

Both breathing zone (BZ) and general area (GA) air samples were collected to determine exposure levels of airborne contaminants. Potential organic emissions were obtained for analysis by using charcoal tubes connected via tygon tubing to sampling pumps calibrated at 200 cubic centimeters per minute (cc/min). Personal sampling pumps operating at 2.0 liters per minute (l/min) were used to determine concentrations of those metals listed in Table II. It should be noted that vapor samples for H_2O_2 were not obtained, because of the lack of specific sampling and analytical methods. Therefore, screening for oxidizing agents such as hydrogen peroxide was performed by Quant TM Ether Peroxide Test. This test consists of wiping a strip of treated litmus paper across an exposed surface, and then comparing the reacted section of the paper to a colorimetric parts per million (ppm) scale.

Analysis of the charcoal tubes were performed by following modified NIOSH Method S-65 for isopropanol and Method S-336 for trichloroethylene. Samples corresponding to aluminum, iron, zinc, magnesium and cadmium (filters) were analyzed by atomic absorption spectrophotometer as described in NIOSH Method P&CAM 173. The bulk H_2O_2 samples, after dilution were filtered for particulate removal prior to analysis. Following additional dilution, an aliquot of each sample was injected into an ion chromatograph. The peaks of both samples matched that of hydrogen peroxide (Table I).

Employee interviews were obtained by direct questionnaires to determine an exposure duration/hair discoloration correlation.

C. Evaluation Criteria

1) Environmental Criteria

The three primary sources of environmental evaluation criteria considered in this report are (a) NIOSH Criteria for Recommended Standards; (b) American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV's); and (c) Occupational Health and Safety Standards as promulgated by the Occupational Safety and Health Administraton (OSHA), U.S. Department of Labor (29 CFR 1910.1000).

Whenever possible, the NIOSH recommended standard will be the environmental criteria applied since this represents the most recent knowledge concerning acute and/or chronic exposures. If such a standard does not exist, the next most stringent recommended level or legal standard will be used.

Substance	NIOSH	ACGIH	OSHA
Hydrogen Peroxide	---	1 ppm (90% strength)	1 ppm (90% strength)
Isopropanol	400 ppm	400 ppm	400 ppm
Trichloroethylene	50 ppm	50 ppm	100 ppm
Aluminum	---	10 mg/M^3	15 mg/M^3
Iron (oxide fume)	---	5 mg/M^3	10 mg/M^3
Zinc (oxide)	5 mg/M^3	5 mg/M^3	5 mg/M^3
Magnesium (Mg)	---	10 mg/M^3	15 mg/M^3
Cadmium (Cd)	0.04 mg/M^3	0.05 mg/M^3	0.1 mg/M^3

The above criteria in ppm or mg/M^3 are based on an 8-hour time-weighted average exposure (TWA).

2) Environmental Toxicology

Hydrogen Peroxide-(90%) weight solution[1,2] - Symptoms, from exposure to H_2O_2 solutions as well as vapors, vary from mild to severe, depending on the concentration. For instance, solutions of H_2O_2 of 35 weight % and over can easily cause blistering of the skin. Irritation caused by H_2O_2 which does subside upon flushing with water should be treated by a physician. The eyes are particularly sensitive to irritation by this material. Animals exposed six hours per day, five days per week for six months at concentrations of 7 ppm (90% solution) developed external body irritation, sneezing, lacrimation and bleaching of the hair. Autopsy disclosed greatly-thickened skin, but no hair follicle destruction. The lungs of these animals were found irritated, however, no significant changes in blood or urinary constituents were observed.

Isopropanol (isopropyl alcohol - $H_3CHOHCH_3$)[3] - Vapors of this isomer are mildly irritating to the conjunctiva and mucous membranes of the upper respiratory tract. No cases of poisoning from industrial exposure have been reported. However, n-propyl alcohol can produce mild central nervous system depression and isopropyl alcohol is potentially narcotic in high concentrations.

* Treated as a nuisance dust for compliance purposes

Trichloroethylene ($ClCH=CCl_2$)[4] - Trichloroethylene exposures may cause irritation of the eyes, nose, and throat. If splashed in the eyes, it may cause burning irritation and damage. Repeated or prolonged skin contact with the liquid may cause dermatitis. Preliminary evaluation of the carcinogenic activity of trichloroethylene in laboratory rodents by the National Cancer Institute indicates the material to be a potent liver carcinogen.

Acute exposure to $ClCH=CCl_2$ depresses the central nervous system, exhibiting such symptoms as headache, dizziness, vertigo, tremors, nausea, and vomiting, irregular heartbeat, fatigue, blurred vision, and intoxication similar to that of alcohol. If alcohol has been consumed, the overexposed person may become flushed.

Aluminum (Al)[5] - A light, silvery-white, soft, ductile, malleable ampholeric metal, soluble in acids or alkali, insoluble in water. Most hazardous exposures associated with this metal occur in smeltering and refining processes. Particles of aluminum deposited in the eye may cause necrosis of the cornea. Salts of aluminum may cause dermatosis, eczema, conjunctivitis, and irritation of the mucous membranes of the upper respiratory system by the acid liberated by hydrolysis.

Iron (Fe)[6] - Soluble iron salts, especially ferris chloride and ferric sulfate, are cutaneous irritants and their aerosols are irritating to the respiratory tract. Iron compounds as a class are not associated with any particular industrial risk.

Zinc (Zn)[7-8] - Zinc is an essential element in human metabolism; the normal intake in food is 10 to 15 mg/day, and the average urinary excretion is 0.3 to 0.4 mg/24 hours. 0.6 to 0.7 mg zinc/liter of urine have been found in workers exposed to zinc oxide fume in concentrations of 3 to 5 mg/M^3. Inhalation of zinc oxide fume causes an influenza-like illness termed "metal fume fever." Chills resulting from this illness have been reported by workers exposed to concentrations below 5 mg/M^3.

Magnesium (Mg)[9] - Magnesium analyzed as MgO is a mild irritant of the eyes and nose. Examination of 95 workers exposed to an unspecified concentration of magnesium oxide dust revealed slight irritation of the eyes and nose; the magnesium level in the serum of 60 percent of those examined was above the normal upper limit of 3.5 mg percent. Metal fume fever has been reported by workers exposed to increased concentrations of the fume.

Cadmium (Cd)[10-11] - Cadmium is an irritant to the respiratory tract. Prolonged exposure can cause anosmia and a yellow stain or ring that gradually appears on the baseline of the teeth. Cadmium compounds are poorly absorbed from the intestinal tract, but relatively well absorbed by inhalation. Once absorbed, cadmium has a long half-life and is retained in the kidney and liver. Acute toxicity is almost always caused by inhalation of cadmium fumes or dust which are produced when cadmium is heated. There is generally a latent period of a few hours after exposure before symptoms develop. Occupational exposure to cadmium has been implicated in a significant increase in prostate and respiratory tract cancer.

IV. RESULTS AND DISCUSSION

The major objective of the health hazard evaluation was to identify substance(s) in the phosphor slurry application areas (Rooms 1, 3, 6, and 9) that were allegedly causing employees' scalp hair to change colors.

As noted in Table IV (resulting from personal interviews) employees assigned to the final red inspection areas observed hair discoloration in 4 days to 8 weeks. When reassigned to areas away from the slurry application process, the employees' hair assumed its original color. Colorimetric screening data obtained from the Final Red Inspection Areas (Table I) indicated the presence of a strong oxidizer (hydrogen peroxide) which ranged from less than 1 to greater than 160 parts per million (maximum scale - 160 ppm). Additionally, the bulk film solution samples indicated levels of 5.7% (57,000 ppm) to 6.0% (60,000 ppm) H_2O_2. It should be noted that "drugstore peroxide," a 3 to 4% solution, generating 10 to 12 volumes* of oxygen, is commonly used for bleaching hair at home. For more rapid action such as in beauty shops 5 to 6%, 17 to 20 volumes are generally used. Accordingly, the 5.7 to 6.0% found in the bulk samples indicate the presence of a potentially strong hair bleaching agent.

Airborne concentrations of aluminum, iron, zinc, magnesium and cadmium (Table II) are all well within both the OSHA standard and NIOSH Recommended 8-hour time-weighted criteria. In addition, no overexposure problems were disclosed from the charcoal tube samples which were analyzed for isopropanol and trichloroethylene.

V. RECOMMENDATIONS

1. Since there is a strong possibility that the discoloration is the result of a direct contact of a settled air contaminant with the hair, prevention may be achieved through the use of protective head coverings and a thorough showering at the completion of each workshift.

2. The red final protective film application area should be enclosed in such a manner to eliminate potential H_2O_2 contamination from being released into the employees' work area(s).

* Pure H_2O_2 is usually sold as solutions identified by "volume control," that is the number of volumes of available oxygen liberated by a given volume of the solution.

3. In areas where contact with irritating or corrosive chemicals will occur, impervious (plastic or rubber) clothing should be worn, particularly gloves.

4. A training program should be set up to make employees aware of the potential contaminant (H_2O_2), its source, and a means of eradication and/or protection.

5. A substitute for the H_2O_2 solution should be considered if the hair discoloration problem continues.

VI. AUTHORSHIP AND ACKNOWLEDGEMENTS

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VII. REFERENCES

1. Oberst, F.W., Comstock, C.C., and Hackley, E.B.: Arch. Ind. Hyg. & Occ. Med., Volume 10, page 319 (1954).

2. American Industrial Hygiene Association, Hygienic Guide: Hydrogen Peroxide (1957).

3. Proctor, N.H. and Hughes, J.P.: Chemical Hazards of the Workplace, J.B. Lippincott Company (Publisher), Philadelphia, 1978.

4. U.S. Department of Health, Education, and Welfare, CDC, PHS, Occupational Diseases -- A Guide To Their Recognition, DHEW (NIOSH) Pub. No. 77-181, June, 1977.

5. Ibid.

6. Ibid.

7. Ibid.

8. Proctor, N.H. and Hughes, J.P.: Chemical Hazards of the Workplace J.B. Lippincott Company (Publisher), Philadelphia, 1978.

9. Ibid.

10. Ibid.

11. U.S. Department of HEW, CDC, PHS: Criteria for a Recommended Standard, Occupational Exposures to Cadmium, HEW Publication No. (NIOSH) 76-192, August, 1976.

12. Balsam, M.S. and Sagarin, E.: Cosmetics Science and Technology, 2nd Edition, Volume 2, Copyright 1972 (Bleaching Agents).

VIII. DISTRIBUTION AND AVAILABILITY OF REPORT

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 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 address.

Copies of this report have been sent to:

a) RCA Corporation, Marion, Indiana
b) I.B.E.W., Local 1160
c) Union Insurance Coordinator, I.B.E.W.
d) Union Safety Representative, I.B.E.W.
e) Industrial Relations Rep. Safety, I.B.E.W
f) NIOSH, Region V
g) OSHA, Region V

For the purpose of informing the "affected employees," the employer shall promptly "post" the determination report for a period of 30 days in a prominent place near where the exposed employees work.

TABLE I

Results of Wipe Samples Collected for Hydrogen Peroxide
RCA Corporation

Marion, Indiana

October/November 1979

Sample #	"Final Red" Location	Type of Sample/Description	Concentration parts per million
1	Rm. #9	Line Operator & Panel Inspection	≥3 ppm
2	Rm. #9	" " " "	≤1 ppm
3	Rm. #9	" " " "	>5-10 ppm
4	Rm. #9	Dipped into H_2O_2 Cleaning Solution	>160 ppm
5	Rm. #9	Table Screen inspection area	≥3 ppm
6	Rm. #9	10 feet from H_2O_2 Applicator	≥1.5 ppm
7	Rm. #3	Area 10' from Slurry Applicator	≤20 ppm
8	Rm. #3	Screen Wipe area	>1-<3 ppm
9	Rm. #3	Operator rubbed finger across screen	≤10 ppm
10	Rm. #1	Dipped into H_2O_2 Cleaning Solution	>160 ppm
11	Rm. #1	10 feet from H_2O_2 Applicator	>1.5-<5 ppm
12	Rm. #1	Line Operator's right hand	>1.5-<5 ppm
13	Rm. #1	Line Operator's right hand	≥1 ppm
14	Rm. #6	Dipped into H_2O_2 Cleaning Solution	>160 ppm
15	Rm. #6	Area between H_2O_2 Applicator & Inspect. Sta.	≤3 ppm
16	Rm. #6	Final Inspection Area	10 ppm

	Percent of Hydrogen Peroxide found in Sample
Bulk Film Sample from Rm. #9	5.7% or 57,000 ppm
Bulk Film Sample from Rm. #3	6.0% or 60,000 ppm

TABLE I
(continued)

Marion, Indiana
November 1, 1979

Sample #	"Final Red" Location	Type of Sample/Description	Concentration (ppm)
17	Slurry Room #1	Area 2 feet from H_2O_2 Application	>3-<10 ppm
18	Slurry Room #1	Area 10 feet from H_2O_2 Application	<1 ppm
19	Slurry Room #6	Right hand of worker-inspection station	≥3 ppm
20	Slurry Room #6	Dipped in Slurry application solution	>160 ppm
21	Slurry Room #6	2 feet from H_2O_2 Application area	>3-<10 ppm
22	Slurry Room #6	Line- light inspection station	>3-<10 ppm
23	Slurry Room #6	Line- 4 to 5 feet from H_2O_2 Application	<10 ppm
24	Slurry Room #6	Opposite side-away from H_2O_2 Applicator	<1 ppm
25	Slurry Room #6	Blue Application Inspection Area	Non detectable
26	Slurry Room #6	Canopy over final red inspection area	<3 (side next to H_2O_2 applicator)
27	Slurry Room #6	Canopy over final red inspection area	Non-detectable
28	Slurry Room #6	Canopy over final red inspection area	Non-detectable
29	Slurry Room #3	Blue Station Relief Operator	>1 ppm
30	Slurry Room #3	Line Operator	>1 ppm
31	Slurry Room #3	Line Operator	>1 ppm
32	Slurry Room #3	Green Application Area	<1 ppm
33	Slurry Room #3	Green Line Operator	<1 ppm
34	Slurry Room #9	Blue & Green Application area	<1 ppm to non detectable
35	Slurry Room #9	Workers' hair - final red inspection	>5-<10 ppm
36	Slurry Room #9	Workers' hair - final red inspection	>3-<10 ppm
37	Slurry Room #9	Workers' hair - final red inspection	>3-<10 ppm
38	Slurry Room #9	Workers' hair - final red inspection	>3-<10 ppm
39	Slurry Room #9	Workers' eyebrow final red inspection	>1- <3 ppm

TABLE 1
(continued)

Marion, Indiana
November 1, 1979

Date	Sample #	"Final Red" Location	Type of Sample/Description	Concentration (ppm)
11/1	46	Slurry Room #9	Personal-back of right hand	≥3 ppm
11/1	41	Slurry Room #9	Personal-back of right hand	≥3 ppm
11/1	42	Slurry Room #9	Area-dipped in H_2O_2 cleaning solution	160 ppm
11/1	43	Slurry Room #9	Area-within 2' of H_2O_2 Application	≥10 ppm
11/1	44	Slurry Room #9	Lines-panel wipe station	≤1 ppm
11/1	45	Slurry Room #9	Final red inspection-table top	≤10 ppm
11/1	46	Slurry Room #9	Quality Control Inspection area	<1 ppm
11/1	47	Slurry Room #9	Personal-back of hand quality control	>3-<10 ppm
11/1	48	Slurry Room #9	Personal-right arm-quality control	>3-<10 ppm
11/1	49	Slurry Room #3	Personal-left hand of worker	≥1 ppm
11/1	50	Slurry Room #3	Personal-left hand of worker	≥1 ppm
11/1	51	Slurry Room #3	H_2O_2 Application - cleaning solution	>160 ppm
11/1	52	Slurry Room #3	Area between inspection station & H_2O_2 Application	≥3 ppm
11/1	53	Slurry Room #3	Vent duct in H_2O_2 Application area	>-<10 ppm
11/1	54	Slurry Room #1	Personal-cap inspector's hand	≥1 ppm
11/1	55	Slurry Room #1	Dipped in H_2O_2 Application solution	>160 ppm

TABLE II

Results of Filter Samples of Airborne Contaminants
RCA Corporation

Marion, Indiana

October/November 1979

Date	"Final Red" Location	Sample #	Description	Time	Volume (liters)	Aluminum	Iron	Zinc	Magnesium	Cadmium
						Concentration in milligrams per meter cubed (mg/M^3)				
10/31	Room #9	AA-13	Operator-Line	1545-2255	600	ND	ND	ND	ND	ND
10/31	Room #9	AA-14	Operator-Line	1547-2250	642	ND	ND	0.003	ND	ND
10/31	Room #9	AA-15	Cap Inspector	1549-2257	507	ND	ND	0.01 mg/M^3	ND	ND
10/31	Room #9	AA-12	Inspection table	1551-2315	666	ND	ND	ND	ND	ND
10/31	Room #3	AA-08	Cap Inspector	1600-2256	578	ND	ND	0.01 mg/M^3	ND	ND
10/31	Room #3	AA-11	Along wall-isle	1610-2256	609	ND	ND	0.01 mg/M^3	ND	ND
10/31	Room #3	AA-10	Inspection table	1612-2255	604	ND	ND	ND	0.001	ND
10/31	Room #1	AA-01	Cap Inspector	1620-2256	594	ND	ND	ND	ND	ND
10/31	Room #1	AA-04	Screen Inspector	1622-2257	592	ND	ND	ND	ND	ND
10/31	Room #1	AA-02	Line-area	1625-2259	591	ND	ND	ND	0.001	ND
10/31	Room #6	AA-06	Screen Inspector	1630-2250	507	ND	ND	ND	ND	ND
10/31	Room #6	AA-07	Red Inspection Area	1630-2251	571	ND	ND	ND	ND	ND
10/31	Room #6	AA-05	Slurry Mix Area	1632-2254	573	ND	ND	ND	ND	ND
10/31	Room #9	AA-03	Center of slurry mix area	1640-2247	550	ND	ND	ND	ND	ND
10/31	Room #9	AA-09	Slurry Mix Operator	1641-2246	547	ND	ND	0.02	ND	ND
11/1	Room #9	AA-27	Quality Control	0700-1452	708	ND	ND	0.01 mg/M^3	ND	ND
11/1	Room #9	AA-18	Line Operator	0701-1456	712	ND	ND	0.01 mg/M^3	ND	ND
11/1	Room #9	AA-17	Panel Inspector	0710-1451	691	ND	ND	0.01 mg/M^3	ND	ND
11/1	Room #9	AA-19	Blue Application Area	0755-1455		ND	ND	ND	ND	.002 mg/M^3
11/1	Room #9	AA-20	Line Operator	0740-1452	86	ND	ND	ND	ND	ND

TABLE II
(continued)

Concentration in milligrams per meter cubed (mg/M^3)

Date	"Final Red" Location	Sample #	Description	Time	Volume (liters)	Aluminum	Iron	Zinc	Magnesium	Cadmium
11/1	Room #3	AA-24	Panel Inspector	0715-1459	696	ND	ND	ND	ND	ND
11/1	Room #3	AA-23	Line Operator	0720-1456	684	ND	ND	ND	ND	ND
11/1	Room #3	AA-25	Line Operator	0720-1454	681	ND	ND	ND	ND	ND
11/1	Room #3	AA-26	Center of slurry room	0720-1450	445	ND	ND	ND	ND	ND
11/1	Room #1	AA-28	Panel wiping	0730-1445	652	ND	ND	ND	ND	ND
11/1	Room #1	AA-29	Operator Line	0735-1446	646	ND	ND	ND	ND	ND
11/1	Room #1	AA-21	Table Opposite Line	0735-1448	649	ND	ND	ND	ND	ND
11/1	Room #6	AA-22	Line Operator	0744-1420	631	ND	0.001	0.03 mg/M^3	ND	ND
11/1	Room #6	AA-16	Table near inspector	0745-1420	630	ND	ND	ND	ND	ND

TABLE III

Results of Charcoal Tube Samples

RCA Corporation

Marion, Indiana

Date	"Final Red" Location	Sample #	Description	Time	Volume (liters)	Concentrations-parts per million parts of liquid (ppm) Isopropanol	Trichloroethylene
10/31	Rm. #1	CT-01	Line-final inspection	1540-2254	80.0	7.1	0.4
10/31	Rm. #9	CT-02	Line-final inspection	1545-2254	85.8	5.2	0.4
10/31	Rm. #3	CT-03	Line-final inspection	1600-2255	83.0	3.2	0.3
10/31	Rm. #3	CT-04	Area next to line	1610-2255	82.0	5.9	0.3
11/1	Rm. #9	CT-05	Line-Operator	0700-1446	92.0	2.8	0.2
11/1	Rm. #9	CT-06	Final red inspection	0707-1446	85.8	5.8	0.2
11/1	Rm. #3	CT-07	Final inspection station	0722-1455	90.6	2.5	0.01
11/1	Rm. #3	CT-08	Final red-line	0726-1451	89.0	0.3	0.02
11/1	Rm. #3	CT-10	Blank	----	00.0	0.02	.01
11/1	Rm. #3	CT-11	Blank	N.A.	N.A.	N.A.	N.A.

	Isopropanol	Trichloroethylene
Limits of detection	<0.01 mg/sample	<0.01 mg/sample

TABLE IV

Results of Personal Interviews
Obtained from Slurry Application Areas
RCA Corporation

Marion, Indiana

October/November 1979

Job Title		Shift	Location	Time of Exposure	Noted Color Change	Original Color Returned
Red Final Inspection	1	1st	Rm #9	2 years	2 Weeks	3 months
" "	1	1st	Rm #9	4 years	1 1/2 Months	1 month
Relief	1	1st	Rm #9	8 years		
Red Final Inspection	1	1st	Rm #3	8 years		3 months
" "	1	1st	Rm #9	3 weeks		
" "	1	1st	Rm #9	9 weeks	2 weeks	
" "	1	1st	Rm #9	2 years	2 months	
" "	1	1st	Rm #9	2 years	2 months	
" "	1	1st	Rm #9	1 1/2 years	2 months	
" "	1	1st	Rm #3	2 1/2 years	2 months	
Matrix	1	1st	Rm #9	1 month	1 month	1 month
Red Final Inspection	1	2nd	Rm #9	4 weeks	2 weeks	
" "	1	2nd	Rm #9	1 month	2 weeks	
" "	1	2nd	Rm #9	2 weeks	4-5 days	
" "	1	2nd	Rm #9	7 months	1 1/2 months	
" "	1	2nd	Rm #9	1 1/2 months	3-4 days	
Relief	1	2nd	Rm #3	3 years	2 weeks	5-6 months
Red Final Inspection	1	2nd	Rm #9	1 year		
	1	3rd	Rm #9	2 years	Yes	
	1	3rd	Rm 9	8 months	2 months	
	1	3rd	Rm #9	6 months	2 weeks	4-5 months
	1	3rd	Rm #9	4 months	1 1/2 weeks	
	1	3rd	Rm #9	3 years	2 months	
Maintenance		3rd	Rm #3-9	1 year	1 month	3 months