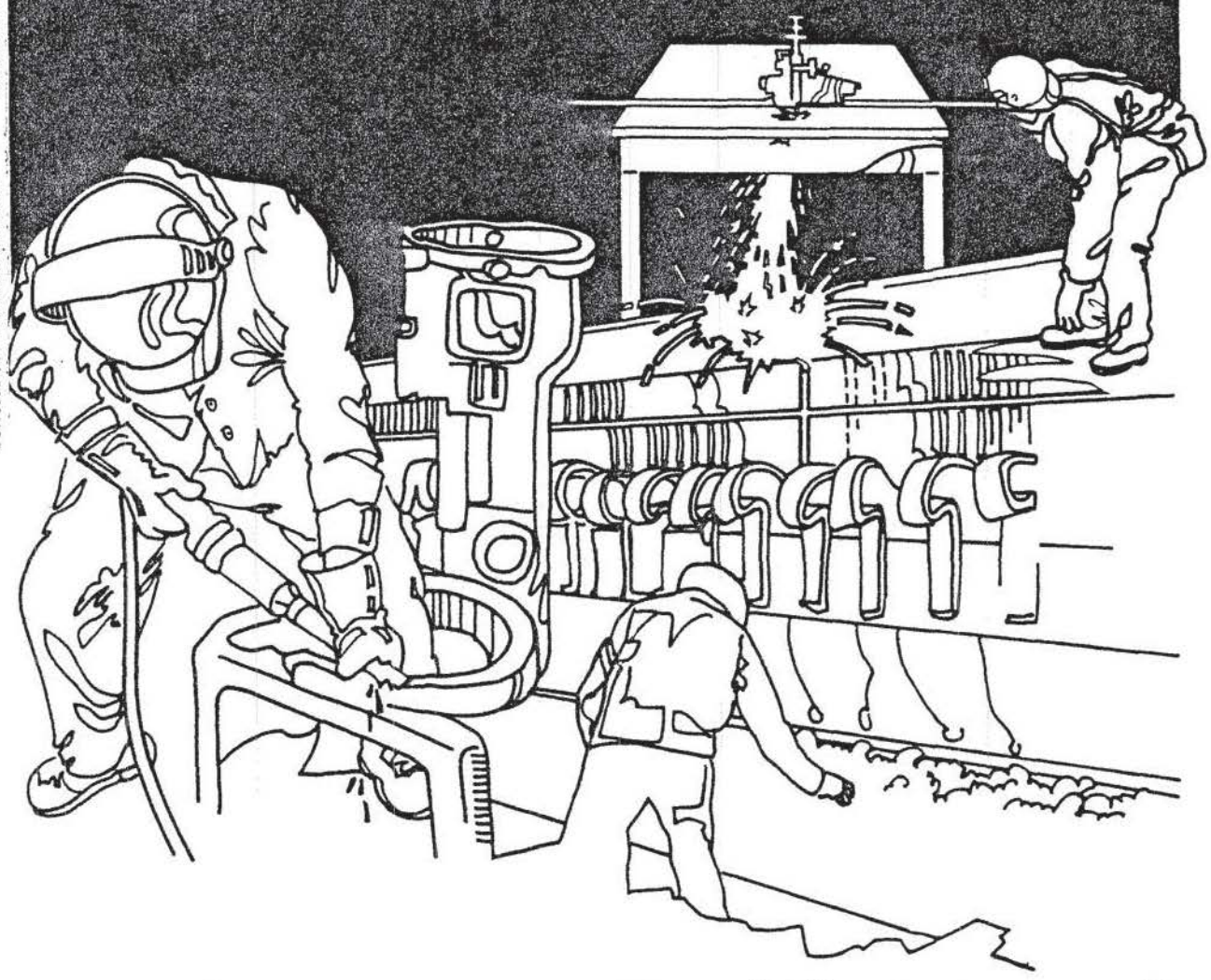
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES Public Health Service
Centers for Disease Control National Institute for Occupational Safety and Health

NIOSH



Health Hazard Evaluation Report

80-226-761

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. 699(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.

HE 80-226-761
October 1980
Sundstrand Data Control
Redmond, Washington

NIOSH INVESTIGATORS:
Arvin G. Apol
William Murray
Wordie Parr

I. SUMMARY

In July 1980, the National Institute for Occupational Safety and Health (NIOSH) received a request from the management of Sundstrand Data Control to determine if a potential health hazard existed to radiofrequency (RF) energy when workers operated a RF heating device.

A RF heater is used to preheat a plastic compound for injection molding of heat sensors used on airplane wings. Approximately three to five persons have access to the work area. An initial/environmental survey was conducted on July 24, 1980 that consisted of measuring both the electric and magnetic RF radiation emissions.

No RF radiation emissions were detected from any surface except 1 to 2 centimeters from the front of the unit where a small pencil sized beam produced a magnetic field meter reading of 0.07 amperes squared per meter squared (A^2/m^2), which is well below the Occupational Safety and Health Administration (OSHA) permissible exposure limit of 0.25 A^2/m^2. It was below detectable limits apjproximately five inches from the surface. The leak was caused by a replacement bolt of excessive length used to hold the handle on the lid. The bolt was shortened to allow the lid to properly fit over the lower chamber which reduced the RF levels to 0.029 A^2/m^2. Replacement of the copper strip which had a groove worn in it from the long bolt should reduce the radiation level even further. The electric field was below the detection capability of the instrument.

On the basis of data in this investigation, NIOSH determined that there was no hazard to RF energy when using the RF heater.

Recommendations are incorporated into this report.

KEYWORDS: SIC 3679 (electronic manufacturers) RF radiation.

II. INTRODUCTION

NIOSH received a request from the employer representative of Sundstrand Data Control (an electronics manufacturer) to determine if a potential health hazard existed to RF energy when operating an RF heater. The initial/environmental survey was conducted on July 24, 1980. A written report including environmental results and recommendations was submitted to the company on September 4, 1980.

III. BACKGROUND

This evaluation involves an RF heater made by Mytron Corporation, Los Angeles, California and is used to preheat the plastic compound "dially phythalate" for injection molding of heat sensors used on airplain wings. The unit was a model 5HP5 which operates at 225 volts, 0.8 amperes, and has a nominal RF input power of 3 killowatts in the frequency range 29-35 megahertz (MHz). Approximately three to five persons have access to this work area. The company was not aware of any previous measurements made on this unit.

IV. EVALUATION, DESIGN AND METHOD

A Hewlett-Packard Model 5303B/5300B, serial # 1520A02460/1452A0228, Frequency Counter/Measuring System mainframe and a Singer Model 90700-2 antena loop with an upper limit of 525 MHz was available to identify the frequency of any detectable RF radiation found emanating from a terminal.

RF measurements were performed with a Narda Model 25540 meter, serial # 04022, and two probes. The Model 8744 probe, serial # 01002, calibrated May 30, 1980, is used to measure the electric field strength in volts squared per meter squared (V^2/m^2) and the Model 8633, serial # 01005, calibrated May 30, 1980, measures the magnetic field strength in ampers squared per meter squared (A^2m^2). The minimum detectable limit for the electric field is 2000 V^2/m^2 and 0.1 A^2/m^2 for the magnetic field. The overall accuracy for probe model 8633 is + 2.5 dB (+ 78%, - 44%) and for model 8644 is + 1.50 dB - 3.5 dB (+ 41%, -55%). All measurements were made by slowly scanning every accessible surface of the terminal as close to the surface as possible (generally within 1-2 centimeters). The 8644 probe is usable in the frequency range of 10-3000 MHz and the 8633 probe between 10-300 MHz.

In addition to the Narda instrumentation, an Instruments for Industry, Inc., Model EFS-2, Serial # 181-B, calibrated April 28, 1980, broad-band, peak detecting electric field sensor calibrated in volts/meter was used. The minimum detectable limit is approximately 1 V/m with a maximum detectable limit of 300 V/m for frequencies ranging from 10 KHz to 200 MHz.

V. EVALUATION CRITERIA

The Occupational Safety and Health Administratio radiation protection standard for occupational exposure to RF and microwave radiation (29 CFR 1910.97) applies to the frequencies 10 - 100,000 MHz. It establishes as a limit for occupational exposures a maximum power density of 10 millowatts per centimeter squared (mW/cm^2), as averaged over any possible six-minute period. In the far field, a power density of 10 mW/cm^2 is equivalent to a mean squared electric field strength of 0.25 A^2/m^2.

VI. RESULTS, DISCUSSION AND CONCLUSION

By using the frequency counter, the frequencies were determined to be in the range as specified by the manufacturer.

Measurements were then made for radiofrequency (RF) radiation (both electric and magnetic field strength). All four sides, the top and bottom of the heating unit were monitored with the detecting probe approximately 1-2 centimeters from the surface. The RF radiation levels from any surface were below the detection capability of the Narda instrument with one exception. A small pencil size beam giving a magnetic field meter reading of 0.07 A^2m^2 was detected in front of unit #SN406. The radiation, however, was below the detectable limits beyond approximately 5 inches (12.7 centimeters) from the surface. Although the measured radiation was well below the permissable exposure limit of 0.25 A^2/m^2, an effort was made to determine the source of the leakage. Further investigation revealed that a small bolt in the leading edge of the lid cover had been improperly replaced with a longer bolt. The new bolt forced the lid slightly open when covering the lower chamber and also had worn a small groove in the copper strip sealing the opening.

When the bolt was shortened to allow the lid cover to properly fit over the lower chamber, the reading was reduced to 0.03 A^2/m^2. This was attributed to the small groove worn in the opposing part. Replacement of the copper strip would reduce the rediation level even further, if not eliminating it completely.

As previously stated, this exposure level is well below the OSHA standard and does not pose a radiation hazard to the employee. This holds especially true in this working situation since no radiation was detected in the operator's working position/

VII. RECOMMENDATIONS

A. Replacement of the copper strip sealing the opening when the lid is closed should reduce even further the RF radiation (magnetic field) leaking from the unit.

B. Whenever possible, equipment should be switched off when not being used. Maintenance and adjustment of the equipment should be performed only while the equipment is not in operation, if possible.

C. After the performance of maintenance or repair, all machine parts, including cabinetry, should be reinstalled so that the equipment is intact and its configuration is unchanged.

VIII. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this 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 22161. 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. Sundstrand Data Control
2. U.S. Department of Labor, OSHA, Region X, Seattle, Washington
3. Washington State Occupational Safety and Health Agency, Olympia, Washington.

For the purpose of informing the three to five affected employees, the employer shall promptly post this Report in a prominent place(s) near the work area of the affected employees for a period of thirty (30) calendar days.

IX. ACKNOWLEDGEMENTS

Report prepared and survey conducted by:

Arvin G. Apol
Industrial Hygienist
Region X/NIOSH
Seattle, Washington

William Murray, Jr.
Chief, Radiation
Section, NIOSH
Cincinnati, Ohio

Wordie Parr, Ph.D.
Chief, Physical Agents
Effects Branch, NIOSH
Cincinnati, Ohio

Originating Office:

Hazard Evaluation and
Technical Assistance
Branch, NIOSH
Cincinnati, Ohio

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
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