U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
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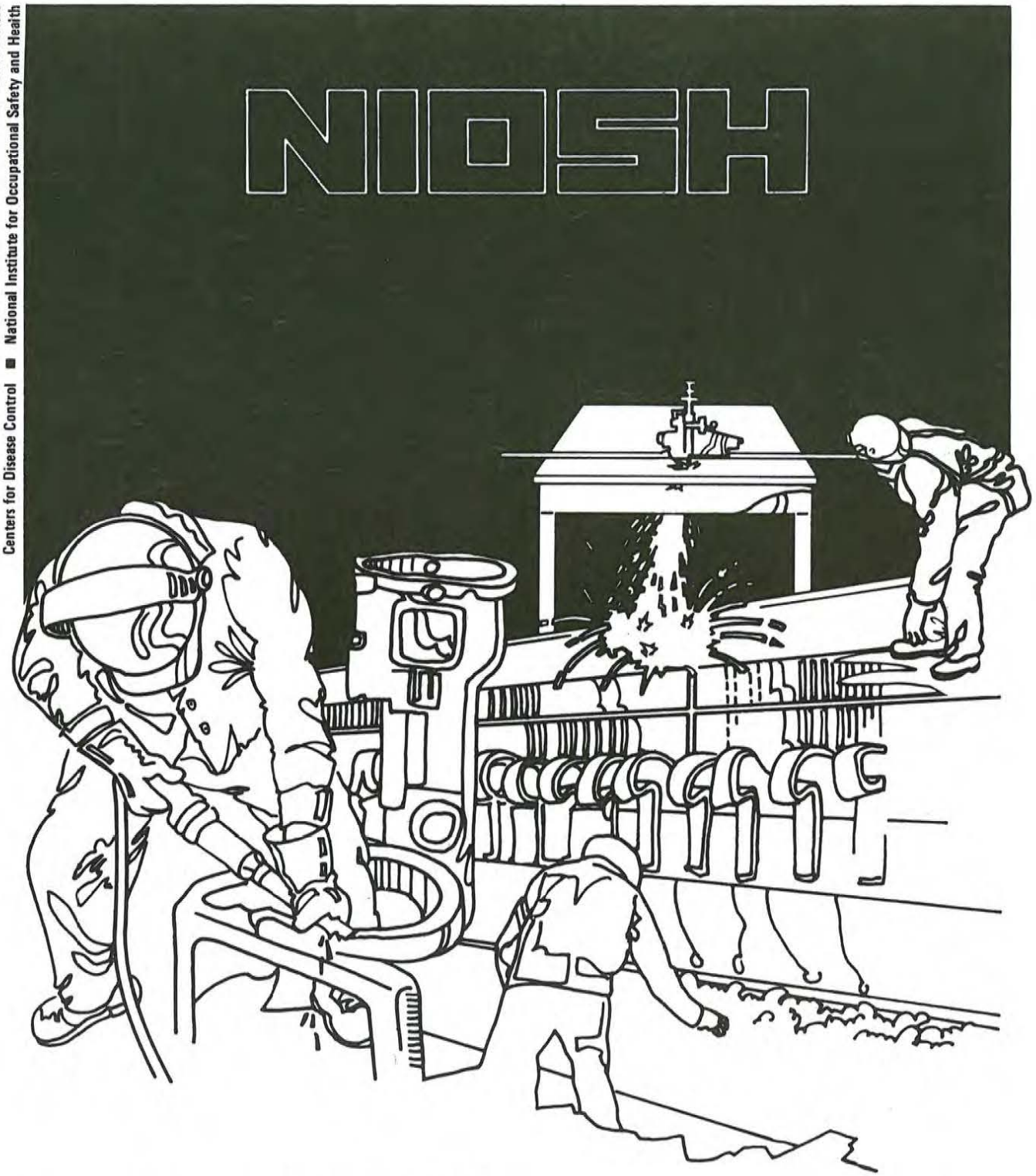

Health Hazard Evaluation Report

HHE 80-145-810
U.S. STEEL FAIRLESS WORKS
FAIRLESS HILLS, PENNSYLVANIA

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.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HE 80-145-810
FEBRUARY 1981
U.S. STEEL FAIRLESS WORKS
FAIRLESS HILLS, PENNSYLVANIA

NIOSH INVESTIGATOR:
DAVID L. CONOVER, PH.D.

I. SUMMARY

In May, 1980 the National Institute for Occupational Safety and Health (NIOSH) received a request from Local 4889 of the United Steelworkers of America at the U.S. Steel Fairless Works to evaluate possible health hazards from radio waves given off by radiofrequency (RF) remote control boxes carried on railroad car operators' waists.

NIOSH performed an evaluation at the facility in September, 1980 in which RF electric field strength measurements were obtained on 11 RF remote control panels. Six of these were being worn by operators at the time; the other five tested were in the maintenance shop.

Electric field strength measurements on all units were below the limit of detection ($< 1\ V^2/m^2$, volt squared per meter squared).

Magnetic field strength (H) measurements on one remote control box were confirmed, as expected with non-detectable E-fields, to be less than 0.1 A^2/m^2, amperes squared per meter squared.

Present OSHA standards are 40,000 V^2/m^2 for electric fields and 0.25 A^2/m^2 for magnetic fields.

Based on the results of RF measurements in which E and H field were below the limit of detection and current knowledge of the biological effects of electric and magnetic fields, NIOSH concludes that railroad car operators are not exposed to hazardous levels of RF radiation.

KEYWORDS: SIC 3310, RF radiation, railroad car operators.

II. INTRODUCTION/BACKGROUND

On May 17, 1980 NIOSH received a request from Local 4889 of the USWA at the U.S. Steel Fairless works. Concern was expressed about the potential health hazard from radiofrequency (RF) remote control units carried by railroad car operators.

On September 23, 1980 NIOSH representatives David Conover and William Shoemaker conducted an environmental investigation to determine potential RF radiation exposure to operators controlling movement of locomotives.

Prior to leaving the Fairless Works, the NIOSH investigators discussed the results of the RF measurements and their interpretation relative to human health hazards with employees, management and union representatives.

III. METHODOLOGY

RF electric field measurements were performed with a Holaday Model HI-3001 (S/N 26004) and two probes. The Model HI-3001 green probe (S/N 014) and the red probe (S/N 015) were calibrated on September 14, 1980 and were used to measure the electric field strength in volts squared per meter squared (V^2/m^2). The minimum detectable limit for the green probe was 5 V^2/m^2 and 5 x 10^3 V^2/m^2 for the red probe. The maximum detectable field strength for the green probe was 10^4 V^2/m^2 and 10^7 V^2/m^2 for the red probe. The overall accuracy of the green and red probes was $\pm$ 2.0 dB (+59%, - 37%). Both the green and red probes have a frequency range of 0.5 MHz to 1000 MHz.

RF measurements were performed with a Narda Model 8619 (S/N 05066) meter and one probe. The Model 8635 (S/N 02001 probe, calibrated September 4, 1980, is used to measure the magnetic field strength in amperes squared per meter squared (A^2/m^2). The minimum detectable limit is 0.1 A^2/m^2 for the magnetic field. The overall accuracy for the Model 8635 probe is $\pm$ 3.0 dB (+ 100%, - 50%). The Model 8635 probe is usable in the frequency range of 20-300 MHz.

RF electric field measurements were made on six RF remote control panels which were attached to the waists of the operators. Following these measurements, RF measurements were made on five additional RF control panels in the Electronics Shop at the Central Maintenance Shop. The measurements were made with the RF control panels on the work benches where maintenance is normally performed.

IV. RESULTS AND CONCLUSIONS

A summary of RF measurement data is contained in Table I. RF measurements were made at locations in close vicinity to the RF control panels while attached to the operator's waist. Measurements were made in front and at the sides of the RF control panels. Magnetic field strength measurements were not made on these units because the antenna used in the remote control boxes emits a dominant electric field. A dominant electric field has a higher electric field strength than magnetic field strength. All the electric field strength measurements were not detectable ($< 1\ V^2/m^2$), therefore, we expected that magnetic field strength measurements would also be below the detection level of the instruments.

Measurements with the Narda Model 8619 meter (S/N 05055) and Model 8635 (S/N 02001) probe on one remote control box confirmed that the magnetic field strengths were less than $0.1\ A^2/m^2$. Present OSHA standards are $40{,}000\ V^2/m^2$ for electric fields and $0.25\ A^2/m^2$ for magnetic fields.

Since all RF, E and H-field measurement data were below the limits of detection of instrumentation used, NIOSH concludes that railroad car operators are not exposed to hazardous levels of RF radiation.

V. AUTHORSHIP AND ACKNOWLEDGEMENTS

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VI. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this report are currently available upon request from NIOSH, Division of Technical Services, Publications Dissemination, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia 22161.

Copies of this report have been sent to:

1. U.S. Steel Fairless Works
2. Local 4889, United Steelworkers of America
3. NIOSH, Region III
4. OSHA, Region III

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

Table I

U.S. Steel Fairless Works

Survey of RF[1] Measurement Data
September 23, 1980

Operator	Manufacturer[2] Model No.	RF E-Field (V^2/m^2)
Loco 1	NA	< 1
Loco 27	NA	< 1
Loco 8	NA	< 1
Loco 7	NA	< 1
Loco 24	NA	< 1
Loco 4	NA	< 1
Shop	RT 0274	< 1
Shop	RT 0052	< 1
Shop	RT 0055	< 1
Shop	NA	< 1
Shop	NA	< 1

1. RF operating frequency 72 MHz
2. Manufacturer - Gould Industries

NA - Model No. not available on control panel unit.

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