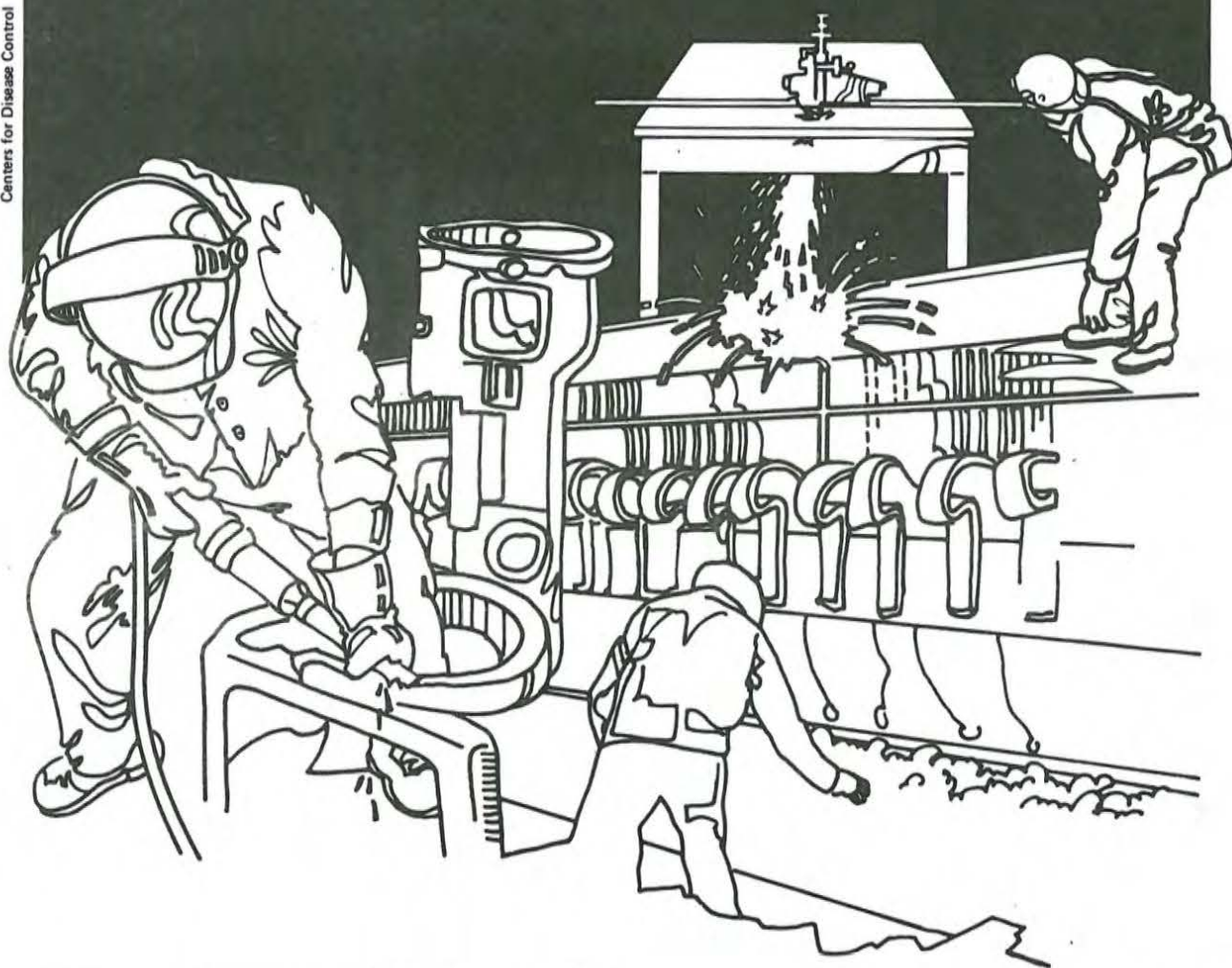


# NIOSH



## Health Hazard Evaluation Report

HHE 80-235-1056  
INLAND STEEL COMPANY  
EAST CHICAGO, INDIANA

## 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.

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

HE 80-235-1056  
March 1982  
Inland Steel Company  
East Chicago, Indiana

NIOSH INVESTIGATOR:  
Peter Orris, M.D., M.P.H.

## I. SUMMARY

On September 9, 1980 the National Institute for Occupational Safety and Health (NIOSH) received a request from the United Steel Workers of America, Local 1010, to conduct a health hazard evaluation at the Inland Steel Company, East Chicago, Indiana. The requestor was concerned with the frequency of cancer deaths among employees who worked in the electrical sequence of the 76 Inch Hot Strip Rolling Mill. Employees in this area were required to spend significant amounts of time in a motor room in which there were capacitors and transformers containing polychlorinated biphenyls (PCB's).

On October 14, 1980 NIOSH conducted an initial survey of the area. Information was collected concerning the number and cause of deaths of employees working in this area between November 1950 and December 1960, and possible exposures to potentially carcinogenic substances.

During the survey, it was noted that these employees were not required to perform internal maintenance operations on equipment containing PCBs, therefore minimizing direct exposure to PCBs. With the exception of inadvertent exposure to low levels of PCBs which could have possibly existed in the area, no exposure to any other known or suspected carcinogen could be identified. Due to the small number of individuals in the study, the expense involved in locating terminated individuals on whom insufficient data was available, the small number and diversity of cancer types found, and the lack of data regarding exposure to carcinogens, a full mortality study was not conducted.

On the basis of the data obtained in this investigation, NIOSH did not identify a known or suspected carcinogenic exposure to employees on the electrical sequence of the 76" Hot Strip Rolling Mill, Inland Steel Company, East Chicago, Indiana. Methodological problems, primarily that of a small group size, make a mortality study in this case unlikely to be productive. Therefore, NIOSH is unable to determine whether a health hazard exists subjecting these employees to a higher than usual risk of developing cancer.

KEY WORDS: SIC 3312 (Steel Works and Rolling Mills), Cancer, Polychlorinated Biphenyls (PCBs), Electrical maintenance.

## II. INTRODUCTION

On September 9, 1980 an authorized representative of the United Steel Workers of America, AFL-CIO, Local 1010, submitted a confidential request for a NIOSH health hazard evaluation at the Inland Steel Company, East Chicago, Indiana. The requester was concerned with the frequency of deaths from cancer among employees who worked on the electrical sequence of the 76 Inch Hot Strip Rolling Mill.

On October 14, 1980 NIOSH responded to the request by conducting an initial survey. Opening conferences were held with union and company representatives. Included in these meetings was a discussion of possible carcinogenic exposures of the workers in question and the feasibility of conducting a mortality study among these employees. Additionally, a walk-through inspection of the area was conducted with representatives of the company and the union.

## III. BACKGROUND

### A. Plant Production and Workforce

The Indiana Harbor plant of Inland Steel manufactures structural steel products. Raw materials are delivered to the plant in the form of coal, limestone, and iron ore and are processed into finished steel. The plant was first opened in the 1930's and at the time of this evaluation employed approximately 23,000 production workers. The particular area of concern in this request is the electrical generating area that supplies the 76 inch hot rolling mill with power. This area has been in operation since 1935 and at the time of the study employed 43 workers.

### B. Description of Employee Duties

The workers in the electrical sequence are employed in the job categories of Motor Room Operator, Motor Room Inspector, and Vocational Motor Room Inspector. The bulk of the working day of these employees is spent in the Motor Room, which is over 2,000 cubic feet in size and separated from the actual rolling mill by brick walls. Contained in the room are seven driving motors for the mill, along with a capacitor and transformer for each. These units are all sealed and some contained polychlorinated biphenyl oil (PCB). The electrical employees in this area are not involved in repair operations and therefore have no direct exposure to the PCB oils.

The employees spend the remainder of their working day in the rolling mill itself and in a basement electrical room located beneath the rolling mill. This room contained resistors, batteries, and breakers, but did not contain equipment with PCBs. In addition, the employees maintained transformers that did not contain PCB's, on the outside of the building.



#### IV. METHODS AND MATERIALS

An initial survey was performed to identify potential toxic exposures to the electrical sequence employees with particular emphasis on possible carcinogens. In addition, information was collected concerning the number and cause of deaths of employees working in this area between November 1950 and December 1960. This cohort was selected to secure a sample for which there was information concerning mortality status and having a substantial period since first exposure to allow for a carcinogenic latent period. This information was obtained from company, union, insurance carrier records, and the personal knowledge of employees. Subsequently, the mortality data available was subjected to biostatistical evaluation to determine the feasibility of executing a full mortality study in this case.

#### V. EVALUATION CRITERIA

##### Polychlorinated Biphenyls (PCBs):

The only potential carcinogenic substances in the motor room were polychlorinated biphenyls (PCBs) contained in the sealed transformers. These are a class of chlorinated aromatic hydrocarbons, which were first available in the United States in 1929, and became widely distributed between 1957 and 1977. Over the past decades, PCBs found a wide range of industrial uses. Properties such as thermal stability, non-flammability, and dielectric capability led to the use of PCBs as a major component in most "askarels" marketed after 1932. Askarel is the generic term used to refer to a broad class of synthetic chlorinated hydrocarbon insulating liquids used in electrical capacitors and transformers. Transformer-grade askarels are usually mixtures of trichlorobenzene and more highly chlorinated PCBs.<sup>1,2</sup>

Based on the adverse reproductive, mutagenic, and carcinogenic effects that PCBs have shown to produce in experimental animals<sup>3</sup>, NIOSH recommends that occupational exposure to PCBs be controlled so that no worker is exposed at a concentration greater than 1.0 microgram per cubic meter ( $\mu\text{g}/\text{M}^3$ ) total PCBs on a Time Weighted Average (TWA) basis for up to a 10-hour workday, 40-hour workweek.<sup>1</sup> PCBs have also been shown to manifest substantial absorption following skin contact, therefore NIOSH recommends proper work practices and protective clothing be used when handling these substances. The current OSHA standard for exposure to PCBs is 1.0 milligram per cubic meter ( $\text{mg}/\text{M}^3$ ) for PCB mixtures containing 42% chlorine, and 0.5  $\text{mg}/\text{M}^3$  for mixtures containing 54% chlorine on an 8-hour TWA basis.<sup>4</sup>

##### 2. Mortality Evaluation

In order to evaluate the advisability of conducting a full scale mortality study of these workers it was decided to assess the approximate number of cancer deaths expected in this group so that the actual known deaths could be compared.

The rate of cancer in the adult white male population of the United States was found to be 219.9 per 100,000 population for the age group 50-54 in 1960.<sup>5</sup> This rate was selected to approximate the mortality rate due to all neoplasms for the group as a whole. This approximation was based on information from NIOSH mortality studies with groups of similar age, sex, and race.<sup>6</sup>

## VI. RESULTS

### A. Environmental

These electrical sequence workers are not routinely exposed to any known or suspected carcinogen that could be identified during the initial survey or subsequent investigation of the materials used in the area. The electrical machinery containing PCB oils are sealed and the employees are not routinely involved in their repair.

### B. Medical

Of 117 men who worked on the electrical sequence in this area between November, 1950 and December 1960: 57 worked less than 1 year, 41 worked from 1 - 5 years, 11 worked from 5 - 10 years, and 8 worked from 10 - 15 years. Of these employees: 36 were first employed 20 - 25 years ago, 57 were first employed 25 - 30 years ago, and 24 were first employed over 30 years ago.

Information as to cause of death was available from company, union, and insurance carrier records only on those employees who died on the job or retired and were eligible for death benefits. Of the 117 employees that worked in the area under study during the 1950's: 14 had died, 24 were retired, 27 were currently employed, and no information was available on 63.

Information supplied by the insurance carrier as to cause of death on 13 of the 14 former employees in this area revealed six of these to be from cancer, including: 1 myelogenous leukemia, 1 colonic cancer, 1 multiple myeloma, and 3 unspecified cancers.

## VII. DISCUSSION

In order to calculate an expected number of cancer deaths for this group of workers it was necessary to estimate the total person years of exposure of the 117 employees who had worked in this area in the 1950's. This figure was developed on the basis of an average of 33 years since first exposure per person, with a 10% reduction to correct for deaths before the time of the study. This produced 3,475 person years.

Based on this number of person years of exposure and the rate of cancer in the adult white male population of the United States, 7.64 deaths due to cancer would be expected in this group of workers. In this study, there were 6 deaths due to cancer among the 65 individuals for which there was information. Of the remaining 63 individuals for which there was no information, 8 cancer deaths would be necessary before a statistically significant difference in rates could be observed to an alpha error of 0.05. Further, a real relative risk for the development of cancer in this population would have to be 2.1 or greater before this increased cancer risk could be detected in 80% of the studies.<sup>7</sup>

In addition, Redmond's review of comparative cause-specific mortality in the steel industry demonstrated the cause-specific frequency of deaths in workers employed in different areas of steel production and compared them with the rates for a total cohort of 58,828 steel workers. This study, published in 1975, did demonstrate no increase in overall mortality nor was any specific cause of death increased in electrical maintenance or repair workers.<sup>8</sup>



In light of the unlikely possibility that such a mortality study would produce a meaningful result, the expense involved in locating these terminated individuals, the diversity of cancer types, and the lack of any documentable exposure to known or suspected carcinogens, the study was not deemed feasible.

#### VIII. RECOMMENDATIONS

1. Continued surveillance of this group of employees by both union and management as to specific causes of death and chronic illnesses is advised.
2. In the event that these employees should encounter hazardous substances in the course of their work (e.g. solvents) proper safety and health precautions should be followed.

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#### XI. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days the report will be available through the National Technical Information Services (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 the following:

- A. United Steelworkers of America, Local No. 1010
- B. United Steelworkers of America, District 31
- C. Inland Steel Company
- D. Confidential Requester
- E. U.S. Department of Labor, OSHA - Region V
- F. NIOSH Regional Offices/Divisions

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



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