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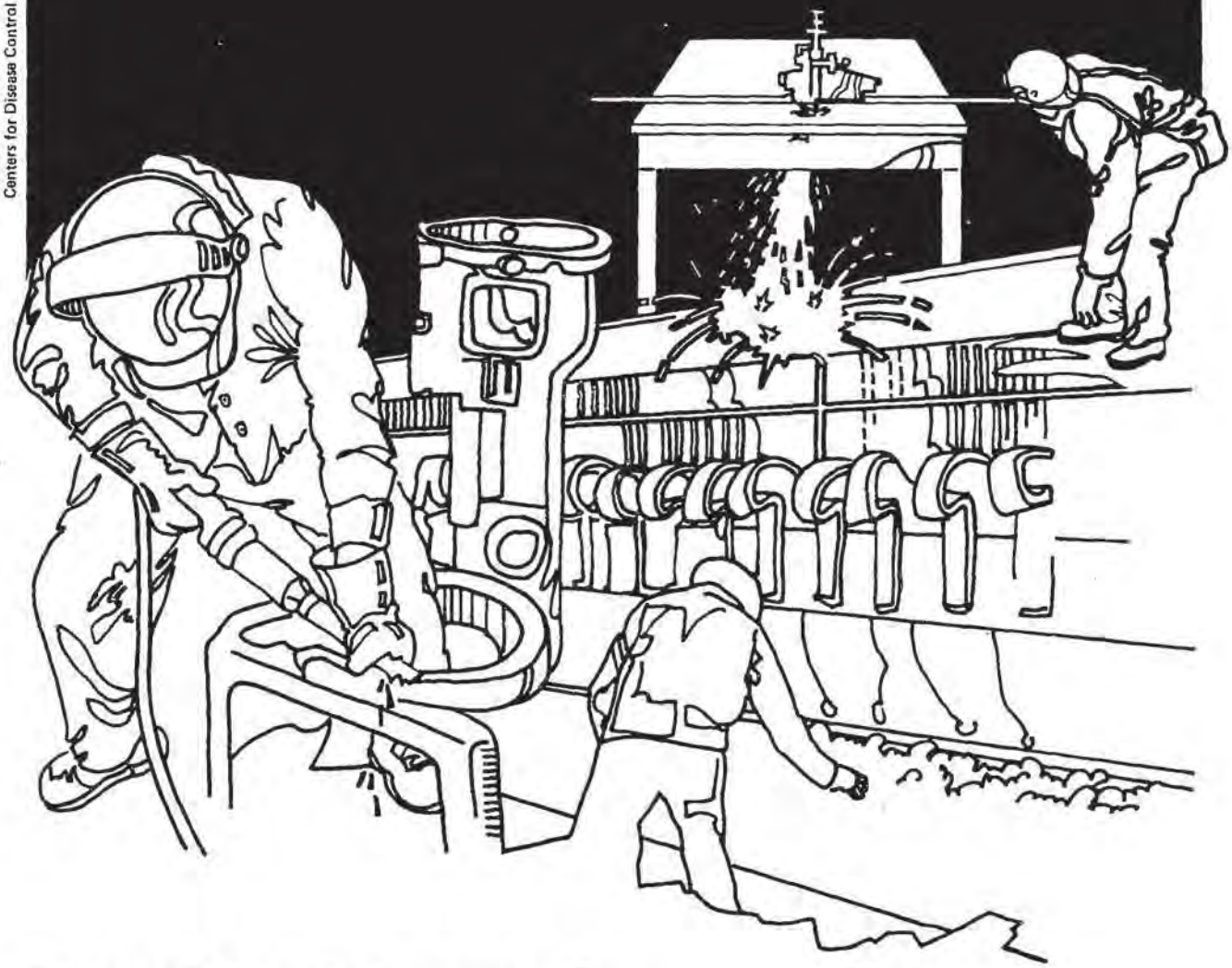

Health Hazard Evaluation Report

HETA 81-302-1014
GARNER-DENVER COMPANY
COMMERCE CITY, COLORADO

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.

HETA 81-302-1014
DECEMBER 1981
GARDNER-DENVER COMPANY
COMMERCE CITY, COLORADO

NIOSH INVESTIGATOR:
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I. SUMMARY

In February 1981 the National Institute for Occupational Safety and Health (NIOSH) received a request from the United Steelworkers of America in Denver, Colorado, to evaluate occupational exposure to noise in the drop forge shop at Gardner-Denver Company, Commerce City, Colorado.

An environmental investigation was not performed since the drop forge operation was closed after the request for an evaluation was received by NIOSH. The only alternative was to perform audiometric testing on all the workers who had worked in the drop forge.

A complete list of present and past workers who had spent time in the drop forge was obtained. All these workers (26) were notified where to receive the cost-free audiometric test. These tests were given on two consecutive Saturdays, September 19 and 26, 1981. Fifty percent (13) of the workers reported for the examinations. All of these workers had significant hearing loss. Twelve of the 13 workers had hearing loss consistent with a history of noise exposure. On eight of the audiograms it was felt that the hearing loss interfered with the worker's ability to understand conversational speech.

On the basis of audiometric tests, NIOSH determined that a health hazard from excessive noise levels in the drop forge probably existed at Gardner-Denver Company, Commerce City, Colorado, prior to this evaluation. The drop forge shop at this facility has been permanently closed. Recommendations that may assist in preventing hearing loss if the drop forge is reopened are included in this report.

KEYWORDS: SIC 3462 (Fabricated Structural Metal Products/Iron and Steel Forgings), audiometric testing, drop forge, noise.

II. INTRODUCTION

NIOSH received a request in February 1981 from the United Steelworkers of America, Denver, Colorado, to evaluate occupational exposure to noise in the drop forge shop at Gardner-Denver Company, Commerce City, Colorado. The drop forge shop was closed permanently after the request for an evaluation was received by NIOSH. Therefore, an environmental investigation was not performed. Audiometric testing of past and present employees of the drop forge was conducted on September 19 and 26, 1981.

III. BACKGROUND

The drop forge shop at Gardner-Denver Company produced various steel products that were mainly used by the mining and drilling industries. A previous health hazard evaluation (HHE 78-114-572) showed excessive levels of air contaminants. Noise determinations were not a part of that survey. However, drop forge shops usually have high noise levels (range from 95 dBA to 130 dBA).

IV. MEDICAL METHODS

All present and past workers (26) who had spent time in the drop forge shop were offered the opportunity to receive cost-free audiometric testing by a local occupational health clinic. These tests were performed on two consecutive Saturdays in September for the convenience of the workers.

V. TOXICOLOGY OF NOISE EXPOSURE

Noise, commonly defined as unwanted sound, covers the range of sound which is implicated in harmful effects. Noise can be classified into many different types, including wide-band noise, narrowband noise, and impulse noise. To describe the spectrum of a noise the audible frequency range is usually divided into eight frequency bands, each one-octave wide, and sound pressure level (SPL) measurements are made in each band using a special sound level meter. A wide-band noise is one where the acoustical energy is distributed over a large range of frequencies. Examples of wide-band noise can be found in the weaving room of a textile mill and in jet aircraft operations.

Narrow-band noises with most of their energy confined to a narrow range of frequencies, normally produce a definite pitch sensation. For a true narrow-band noise, only a single octave band will contain a significant SPL. The noise caused by a circular saw, planer, or other power cutting tools is occasionally of the narrow-band type, but usually there is some spreading of the acoustic energy to several of the octave bands.

The impulse type of noise consists of transient pulses, occurring in repetitive or non-repetitive fashion. The operation of a rivet gun or a pneumatic hammer usually produces repetitive impulse noise. The firing of a gun is an example of non-repetitive impulse noise.

Exposure to intense noise causes hearing losses which may be temporary, permanent, or a combination of the two. These impairments are reflected by elevated thresholds of audibility for discrete frequency sounds, with the increase in dB required to hear such sounds being used as a measure of the loss. Temporary hearing losses, also called auditory fatigue, represent threshold losses which are recoverable after a period of time away from the noise. Such losses may occur after only a few minutes of exposure to intense noise. With prolonged and repeated exposures (months or years) to the same noise level, there may be only partial recovery of the threshold losses, the residual loss being indicative of a developing permanent hearing impairment.

Temporary hearing impairment has been extensively studied in relation to various conditions of noise exposure. Typical industrial noise exposures produce the largest temporary hearing losses at test frequencies of 4,000 and 6,000 Hertz (Hz).

The actual pattern of loss depends upon the spectrum of the noise itself. The greatest portion of the loss occurs within the first two hours of exposure. Recovery from such losses is greatest within one or two hours after exposure.

The amount of temporary hearing loss from a given amount of noise varies considerably from individual to individual. For example, losses at a given frequency due to noise intensities of 100 dBA may range from 0 to more than 30 dB.

Low frequency noise, below 300 Hz, must be considerably more intense than middle or high frequency noise to produce significant threshold losses.

Considerably fewer temporary hearing losses result from intermittent than from continuous noise exposure, even though the total amount of noise exposure is the same in both instances.

Physiologic reactions to a noise of sudden onset represent a typical startle pattern. There is a rise in blood pressure, an increase in sweating, an increase in heart rate, changes in breathing, and sharp contractions of the muscles over the whole body. These changes are often regarded as an emergency reaction of the body, increasing the effectiveness of any muscular exertion which may be required. However desirable in emergencies, these changes are not desirable for long periods since they could interfere with other necessary activities. Fortunately, these physiologic reactions subside with repeated presentations of the noise.

For performance on a task to remain unimpaired by noise, man must exert greater effort than would be necessary under quiet conditions. When measures of energy expenditure--for example, oxygen consumption and heart rate--are made during the early stages of work under noisy conditions they show variations which are indicative of increased effort. Measurements in later stages under continued exposure, however, show responses return to their normal level.

VI. RESULTS

Fifty percent (13) of the workers reported for the examinations. All 13 audiograms showed a hearing loss, 12 characterized as consistent with a history of noise exposure. On eight it was felt that the loss probably interfered with the worker's ability to understand conversational speech. This overwhelming indication of hearing loss indicates that past hearing conservation efforts have been ineffective or nonexistent. The average number of years worked in this department by these workers was 20 years. None of the workers tested has worked in the department less than 15 years. None of the workers had hobbies or other noise exposures that would cause such hearing loss.

VII. DISCUSSION AND CONCLUSIONS

Based on the results of the audiometric testing of past and present employees, a health hazard from excessive noise levels in the drop forge shop probably existed prior to the closing of the drop forge shop. There is presently no health hazard due to noise. Permanent hearing loss is well documented in all workers since none have been exposed to noise in the drop forge shop for at least six months.

VIII. RECOMMENDATIONS

1. A record of this report and a copy of the results of the audiometric examination performed by NIOSH as a part of this evaluation should become a permanent part of the employee's personal medical record.

2. A hearing protection program should be instituted and rigidly enforced if the drop forge reopens.

3. Audiometric testing should be performed yearly. If the worker has any permanent threshold shifts, the hearing protection program should be re-evaluated.

IX. REFERENCES

1. Occupational Diseases - A Guide to Their Recognition, Revised Edition. U.S. Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health, Publication No. 77-181, June 1977, pp. 510-513.

X. AUTHORSHIP AND ACKNOWLEDGMENTS

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XI. DISTRIBUTION AND AVAILABILITY

Copies of this 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 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:

1. Gardner-Denver Company.
2. United Steelworkers of America, Subdistrict 6.
3. United Steelworkers of America.
4. U.S. Department of Labor/OSHA - Region VIII.
5. NIOSH - Region VIII.
6. Colorado Department of Health.
7. State Designated Agency.

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