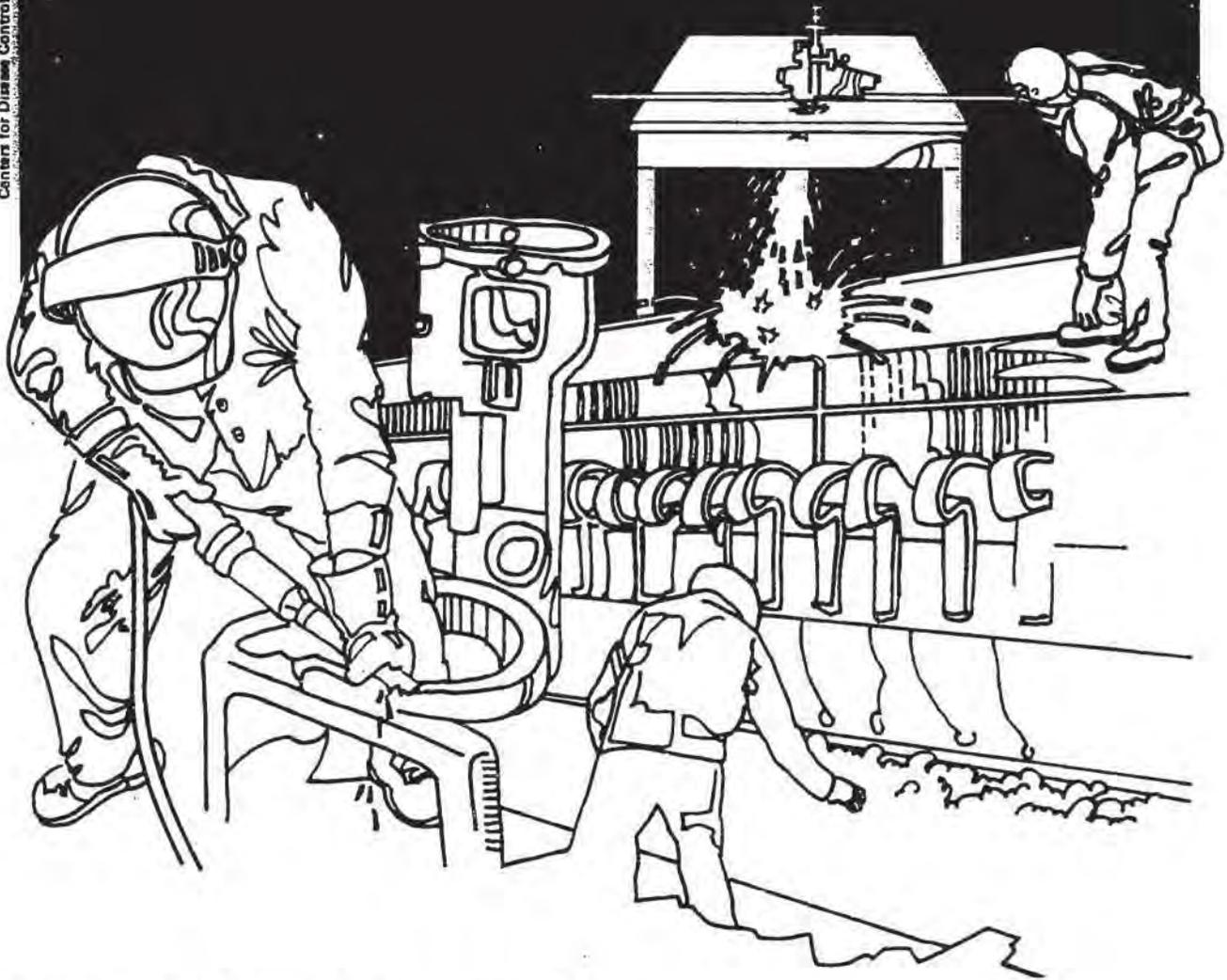


# NIOSH



## Health Hazard Evaluation Report

HETA 82-356-1254  
GALLATIN HOMES CORPORATION  
BELGRADE, MONTANA

## 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.

HETA 82-356-1254  
JANUARY 1983  
GALLATIN HOMES CORPORATION  
BELGRADE, MONTANA

NIOSH INVESTIGATOR:  
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## I. SUMMARY

In August 1982 the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate occupational exposures to noise to workers at Gallatin Homes Corporation, Belgrade, Montana. This facility manufactures large mobile homes from wood building materials.

On November 8-9, 1982, NIOSH performed an environmental investigation at Gallatin Homes Corporation which consisted of direct reading and 8-hour time-weighted average (TWA) noise measurements. A total of eleven personal noise samples and numerous area noise level measurements were taken during the survey period. Eight-hour TWA noise levels on four workers in the highest noise exposure areas were 81.8, 83.6, 88.4, and 86.8 decibels (dBA). One 5-hour, one 4-hour, and five 3-hour TWA measurements were taken (range 71.0 to 82.7). Two of the eleven personal measurements exceeded the NIOSH evaluation criteria of 85 dBA for an 8-hour TWA.

All of these workers were provided adequate hearing protection which consisted of ear muffs and ear plugs.

On the basis of the environmental data collected, NIOSH determined that a potential health hazard from excessive noise levels existed to workers at Gallatin Homes Corporation, Belgrade, Montana. Recommendations that can further assist in preventing hearing loss are included in this report.

KEYWORDS: SIC 1521 (General Contractors--Single-Family Houses), noise, mobile home construction.

## II. INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) received a request in August 1982 from management to evaluate exposures to noise to workers at Gallatin Homes Corporation, Belgrade, Montana. An environmental evaluation was conducted on November 8-9, 1982. The results of the survey were discussed with management during the survey.

## III. BACKGROUND

Plant management at Gallatin Homes Corporation was concerned about possible overexposures to noise during the operating of various saws and automatic nail hammers used during the construction of large mobile homes.

## IV. ENVIRONMENTAL DESIGN AND METHODS

Eleven personal TWA noise measurements were taken using Metrosonic® noise dosimeters which register on a memory cell the dose or noise level received during the exposure period. The results for each minute of exposure can then be displayed as a read-out (hard copy) at the end of the exposure period. The read-out also describes the accumulated exposure for each hour and is described as the average noise exposure for each hour evaluated.

Various noise levels and sound pressure levels were also evaluated around the work sites using a Bruel & Kjoer® (B&K) Precision Sound Level Meter.

## V. EVALUATION CRITERIA AND TOXICOLOGY

### A. Environmental

The two sources of criteria used to assess the workplace concentrations of air contaminants were (1) the Occupational Safety and Health Administration (OSHA) standards (29 CFR 1910.1000), and (2) the NIOSH criteria for a recommended standard.

Exposure to high levels of noise may cause temporary and/or permanent hearing loss. The extent of damage depends primarily upon the intensity of the noise and the duration of the exposure. There is abundant epidemiological and laboratory evidence that protracted noise exposure above 90 decibels (dBA) causes hearing loss in a portion of the exposed population.

OSHA's existing standard for occupational exposure to noise (29 CFR 1910.95) specifies a maximum permissible noise exposure level of 90 dBA for a duration of 8 hours, with higher levels allowed for shorter durations. NIOSH, in its Criteria for a Recommended Standard, proposed a limit of 5 dB less than the OSHA standard.

Time-weighted average noise limits as a function of exposure duration are shown below:

Duration of Exposure (hours/day)	Sound Level, dBA	
	NIOSH Recommended	OSHA Standard
16	80	---
8	85	90
4	90	95
2	95	100
1	100	105
1/2	105	110
1/4	110	115*
1/8	115*	---
	---	140 dB**

\* No exposure to continuous noise above 115 dBA.

\*\* No exposure to impact or impulse noise above 140 dB peak sound pressure level (SPL).

When workers are exposed to sound levels exceeding the OSHA standard, feasible engineering or administrative controls must be implemented to reduce levels to permissible limits. OSHA has recently issued a hearing conservation amendment to its noise standard. For workers exposed at or above a TWA of 85 dB, the amendment will require noise exposure monitoring, employee education, and audiometric testing. Review of audiograms have to be made by an audiologist or otolaryngologist or a qualified physician in their absence. Employees also must be notified of monitoring results within 21 days. Employee records must be kept by the employer for up to five years after termination of employment. Finally, for those employees exposed to noise levels exceeding 90 dBA for eight hours and/or where audiometric testing results indicate a hearing loss, ear protection must be worn.

B. Toxicological<sup>1</sup>

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, narrow-band 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.

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. ENVIRONMENTAL RESULTS AND DISCUSSION

On November 8-9, 1982, NIOSH performed an environmental investigation which consisted of direct reading and 8 hour Time-Weighted Average (TWA) noise measurements, as well as octave band analysis from 31.5 Hertz (Hz) to 31,500 Hz. A total of eleven personal noise samples and numerous area noise level measurements were taken during the survey period. Eight-hour TWA noise levels on four workers in the highest noise exposures areas were 81.8, 83.6, 88.4, and 86.8 decibels (dBA). One 5-hour, one 4-hour, and five 3-hour TWA measurements were taken (range 71.0 to 82.7 dBA). Two of the eleven measurements exceeded the NIOSH evaluation criteria of 85 dBA for an 8 hour TWA. Refer to Tables 1 and 2. When measuring intense noise, the A-weighting feature (referred to as dBA) is used since it simulates the response of the human ear.

All of these workers were provided adequate hearing protection which consisted of ear muffs and ear plugs.

## VII. CONCLUSIONS

A potential health hazard existed to excessive noise levels at Gallatin Homes Corporation during NIOSH's evaluation. Adequate hearing protection was being provided.

## VIII. RECOMMENDATIONS

1. Hearing protection should continue to be provided by management.
2. Audiometric testing should be performed on all new employees and at least yearly on all employees.
3. Noise monitoring should be performed routinely to help supplement the hearing protection program.

## IX. REFERENCES

1. National Institute for Occupational Safety and Health. Occupational Diseases: A Guide to Their Recognition. Revised ed. Cincinnati, OH: National Institute for Occupational Safety and Health, 1977. (DHEW (NIOSH) publication no. 77-181.)
2. Occupational Safety and Health Administration. OSHA safety and health standards. 29 CFR 1910.1000. Occupational Safety and Health Administration, revised 1980.

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XI. DISTRIBUTION AND AVAILABILITY

Copies of this report are currently available upon request from NIOSH, Division of Standard 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. Gallatin Homes Corporation.
2. U.S. Department of Labor/OSHA - Region VIII.
3. NIOSH - Region VIII.
4. Montana Department of Health and Environmental Sciences.
5. 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.

TABLE 1

Noise Measurements dBA in the Hearing Zone (Close Proximity to Ear) of  
 Personnel Operating or Working Close to the Following Equipment  
 (Not Time-Weighted Average)

Gallatin Homes Corporation  
 Belgrade, Montana

November 8-9, 1982

Equipment/Location	dBA (Off)	dBA (On)
Table Saw/Saw Shop	87	102
Rogers Saw/Saw Shop	74	98
Table Saw/Cabinet Shop	72	102
Radial Arm Saw/Cabinet Shop	74	102
Inside Walls/One Inch	74	114
Nail Gun/Cabinet Inside	74	109
Radial Arm Saw/Cabinet Shop	84	110
Nail Gun/Side Walls	82	118
Nail Gun/Legs	80	109
Air Hose/When Disconnecting	80	120
Nail Gun/Inside Walls 2	90	98
Nail Gun/Siding 1	78	109
Router Table	78	98
Welding Shop*	75	75

EVALUATION CRITERIA: NIOSH 8-hour TWA = 85 dBA  
 OSHA 8-hour TWA = 90 dBA

\* High impact noise occurs very seldom when welders are hammering on metal.

TABLE 2

## Three to Eight-Hour TWA Noise Exposure

Gallatin Homes Corporation  
Belgrade, Montana

November 8-9, 1982

Date	Job Description/Location	Sampling Time (hours)	Average TWA Noise Level dBA
11/8	Plumber Leader	3	82.6
11/8	Foreman	3	79.3
11/8	Foreman	3	81.5
11/8	Laborer	3	76.9
11/8	Laborer	3	71.0
11/9	Inside Walls	5	82.7
11/9	Saw Shop	8	81.8
11/9	Interiors	4	82.0
11/9	Saw Shop	8	83.6
11/9	Sidewalls	8	88.4
11/9	Metal #1	8	86.8
EVALUATION CRITERIA:		NIOSH 8-hour TWA	85 dBA
		OSHA 8-hour TWA	90 dBA