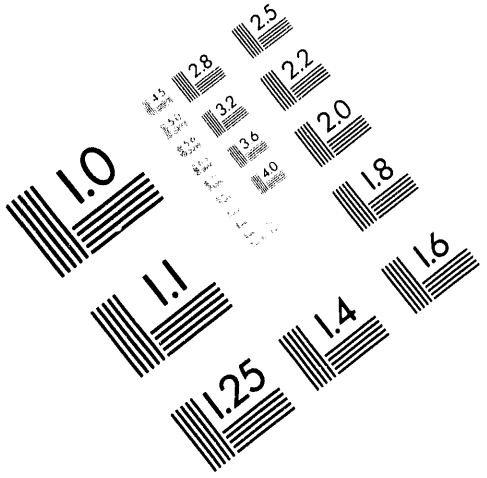

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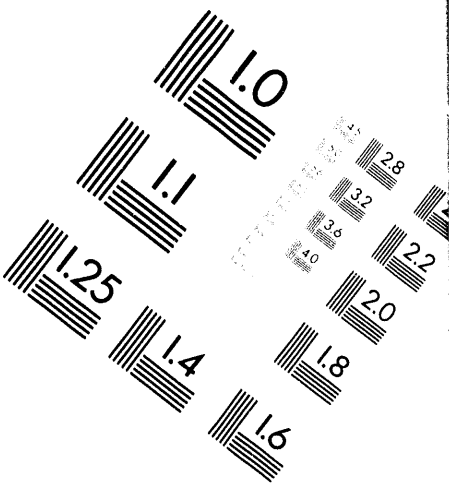

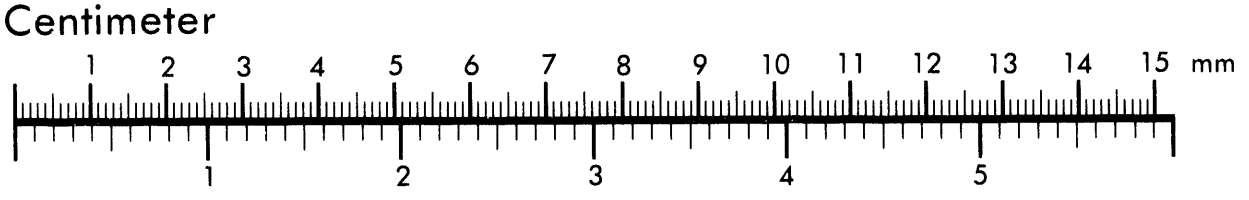

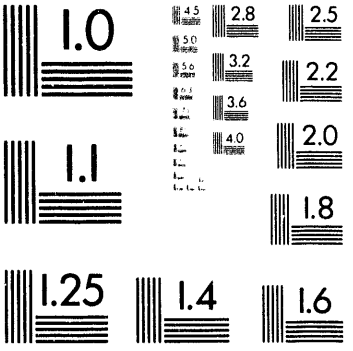

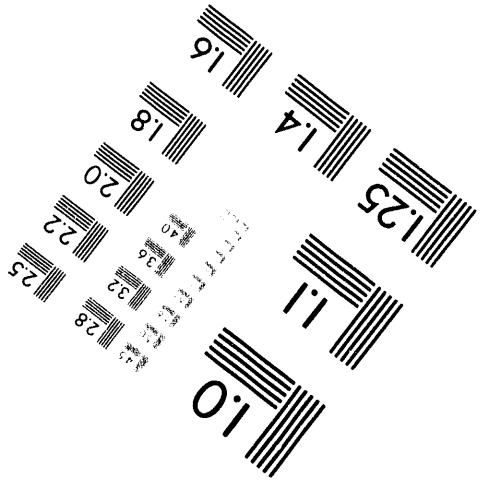

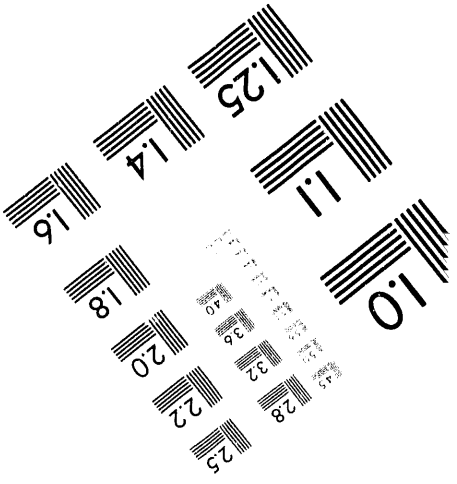

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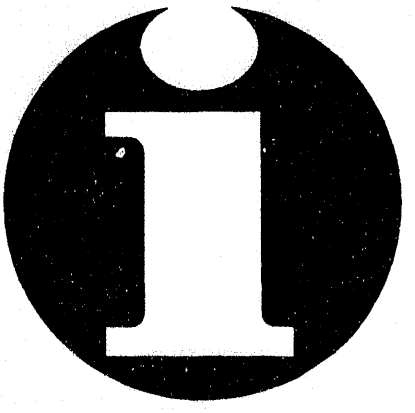
U.S. Department of Labor
Mine Safety and Health Administration

Informational Report
IR 1214
1994



NOISE EXPOSURES IN U.S. COAL MINES

An Informational Report

Number 1214

United States Department of Labor

Mine Safety and Health Administration

NOISE EXPOSURES IN U.S. COAL MINES

by

J.P. Seiler[1], M.P. Valoski[2], and M.A. Crivaro[3]

ABSTRACT

Mine Safety and Health Administration (MSHA) inspectors conduct full-shift environmental noise surveys to determine the occupational noise levels to which coal miners are exposed. These noise surveys are performed to determine compliance with the noise standard promulgated under the Federal Mine Safety and Health Act of 1977. Data from over 60,000 full-shift noise surveys conducted from fiscal year 1986 through 1992 were entered into a computer data base to facilitate analysis.

This paper presents the mean and standard deviation of over 60,000 full-shift noise dose measurements for various underground and surface coal mining occupations. Additionally, it compares and contrasts the levels with historical noise exposure measurements for selected coal mining occupations that were published in the 1970's.

The findings were that the percentage of miners surveyed that were subjected to noise exposures above 100%, neglecting personal hearing protectors, were 26.5% and 21.6% for surface and underground mining, respectively. Generally, the trend is that the noise exposures for selected occupations have decreased since the 1970's.

INTRODUCTION

The enactment of the Federal Mine Safety and Health Act of 1977 prescribed maximum noise exposure levels for miners working in coal mines. 30 Code of Federal Regulations (CFR), Subchapter O,

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Subpart F, Sections 70.500 through 70.511 specifies the noise standard for underground coal mines, and Subpart I, Sections 71.800 through 71.805 for surface coal mines and surface work areas of underground coal mines. These standards are based on the noise standard in the Walsh-Healey Public Contracts Act, in effect when the Federal Coal Mine Safety and Health Act was enacted in 1969.

A noise exposure level can be expressed as the percentage of the "allowable" exposure level. This percentage is called a noise dose. By using a noise dose, it is easily determined if a miner has exceeded current legal exposure limits. Such an exposure would result in a noise dose greater than 100 percent.

Determining the "allowable" exposure level is based on three parameters: 1) Threshold Level, 2) Criterion Level and 3) Exchange Rate. Definitions for each parameter and the value currently used by the Mine Safety and Health Administration (MSHA) follow:

Threshold Level - The noise level below which no dose is accumulated.
MSHA uses 90 dBA.

Criterion Level - The noise level which results in a dose of 100 percent during an 8 hour period.
MSHA uses 90 dBA.

Exchange Rate - The increase in noise level which results in a halving of the allowable exposure time.
MSHA uses 5 dBA.

Current policy for the conducting of noise surveys by MSHA Coal Mine inspectors was initially specified in MSHA Policy Memorandum No. 86-2C issued June 12, 1986. These requirements also appear in Chapter 3 of the Coal Mine Safety and Health (CMS&H) Inspection Procedures Handbook Number 89-V-1 dated February 1989.

MSHA coal mine inspectors are required to conduct full-shift noise surveys. An underground full-shift survey is considered valid only if 1) at least 60 percent of the normal coal production is mined, or 2) the survey shows noncompliance with the noise standard, regardless of the amount of coal mined. For surface occupations, the survey must be representative of the miners normal activities. Upon the completion of each survey, the results of the survey are to be reported on a MSHA 2000-84 Environmental Noise Report Form, with a copy being sent to MSHA's Physical and Toxic Agents Division, Pittsburgh, PA. A copy of this form appears in Appendix 1.

The noise dose that must be reported for each survey is entered as item T: Noise Dosage (percent). If the miner being surveyed is wearing a personal hearing protective device such as a pair of ear muffs, then the inspector must determine the noise reduction rating of the device (NRR) and enter it as item U: NRR Value. In this case an adjusted dose is calculated by the inspector and entered as item V: Adjusted Dosage. For comparison purposes all of the data presented in this paper are those where no reduction of the noise exposure was made due to wearing of hearing protection, i.e., item T.

The current MSHA noise survey policy has had three impacts:

1. Noise dosimeters have replaced sound level meters as the instrument of choice when conducting full-shift noise exposure measurements.

2. At least 60% of the normal activities must be achieved in order for a noise exposure measurement to be considered as valid.

3. The results of all full-shift noise exposure measurements are to be documented in a standard format.

The policy permits MSHA coal mine inspectors to use either sound level meters or noise dosimeters to conduct the full-shift noise exposure surveys. However, coal mine inspectors have exclusively used noise dosimeters when conducting their full-shift noise exposure surveys. Noise dosimeters are small electronic devices which automatically calculate a noise dose. By using noise dosimeters, the coal mine inspectors can conduct multiple surveys at one time. Also, the use of the noise dosimeter is safer for the inspector and the miner because the inspector does not have to follow the miner, recording noise levels and duration times, as the miner performs work activities throughout the shift.

The policy requirement, which requires at least 60% of the normal activities associated with the occupation be conducted when an inspection is performed, serves as a control to insure that noise exposure measurements are being taken which truly represent the miner's normal work tasks. This requirement translates, for underground coal mines, into a requirement that the shift production occurring on the date of the noise exposure measurement be equal to at least 60% of the average shift production for the last 30 days.

Prior to the institution of the policy requirement that all inspectors report full-shift noise exposure surveys in a standard format to a centralized data processing location, there was no organized manner to examine the noise surveys for trends and other analytical information. The noise exposures of miners had been examined during specialized studies, usually of a short term

nature, encompassing very selected occupations and a small sample of miners.

The purpose of this paper is to present a summary compilation of over 60,000 full-shift noise exposure measurements conducted by MSHA coal mine inspectors for an extensive listing of mining occupations, and to contrast the data with that published in the 1970's for selected mining occupations.

ACKNOWLEDGMENT

The authors wish to express their appreciation to the numerous coal mine inspectors that collected the full-shift noise exposure measurements that form the basis of this paper, and the many District CMS&H health specialists who patiently assisted in verifying and correcting the data. Also, appreciation is extended to Ms. Joan Balbach, and Ms. Helena Voitko who screened the data forms and keypunched the data into the computer data base, and the User System Support Branch, of the Mining Information Systems Division, MSHA Denver Safety and Health Technology Center, who guided in the creation of the data base and moved the data over at least three computer systems.

MSHA ENVIRONMENTAL NOISE FORM DATA BASE

Environmental Noise Form

The MSHA Environmental Noise Report form (MSHA 2000-84) was designed to report the results of full-shift noise exposure measurements conducted at surface and underground coal mines. The form consists of three sections: administrative information, technical information, and comments. One form is completed for each mechanized mining unit (MMU), and each form can accommodate up to six full-shift surveys. An Environmental Noise Report Form appears in Appendix 1.

The administrative information section consists of fields for recording information about the mine and the inspector that includes: Mine ID number, Mine Name, Company Name, MMU/Pit/Area ID Number, Average Production, Authorized Representative (AR) Number, AR Signature, and Field Office Code.

Six columns are provided to document information from the full-shift surveys. The information that is collected for each full-shift survey includes: Survey Date, Instrument Type (Sound Level Meter or Dosimeter), Instrument Property Number (No.), Calibrator Property No., Occupation Code, Machine Code, Manufacturer Code,

Time Stop, Time Start, Total Survey Time, Production this Shift, Noise Dosage (percent), Noise Reduction Rating (NRR) Value (if Personal Hearing Protection [PHP] is considered), Adjusted Dosage (if PHP considered), Calibration Check, and the Citation Number (if issued).

The third section, comments, is the space for recording miscellaneous information concerning the survey.

The reverse side of the form supplies codes for the Manufacturer Code and Equipment Code (Machine Code). A companion chart, entitled "Coal Mining Occupations" (MSHA Form 2000-169), provides the user with a standardized listing of Occupation Codes.

The Environmental Noise Report forms are completed after the mine inspection. The form is usually reviewed by a field office supervisor or health specialist and a copy is forwarded within one month to the Physical and Toxic Agents Division. The original form remains in the field office with the uniform mine file.

Data Base

Upon receipt of an Environmental Noise Report form, the data are screened (key fields are checked for valid data). Any corrections are made and the form is keypunched. The data input program double checks the data for valid entry and checks some of the computations. The data is stored in ASCII files which makes it easier to import the data into various commercial software packages. The data for this report was analyzed using QuickBASIC 4.0 (c) Microsoft Corporation, Lotus 1-2-3 (c) Lotus Development Corporation and dBASE IV (c) Borland International, Inc.[4]

The data is divided into separate files based on fiscal year (October 1 through September 30). The field offices have until December 31 to submit the previous fiscal year's data. In January, The Physical and Toxic Agents Division produces a summary report using data from the previous fiscal year.

For the results presented in this paper, all of the data for fiscal year 1986 through the close of fiscal year 1992 were combined into one large file. The file contained only fields for the occupation code and the noise dose. For each occupation code, the mean and sample standard deviation were calculated. Table 1 presents the results for a few selected occupations. Recall that the presented data are the noise doses without considering any personal hearing protection which may have been

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[4] Reference to specific brands, equipment, or trade names in this report is made to facilitate understanding and does not imply endorsement by the Mine Safety and Health Administration.

worn by the miners being surveyed. Data for the entire set of Occupation Codes appear in Appendix 2 and an alphabetical listing of occupations and their corresponding codes appears in Appendix 4.

There is no uniformly applied national strategy for deciding which miners are chosen for noise exposure monitoring. Some inspectors sample all face workers and only sample a limited number of non-face occupations. In other districts, sampling is targeted based on past sampling results. In some areas, sampling is conducted only on those occupations where hearing protective devices are not worn. In some instances sampling is performed on all occupations. It is common to conduct dust and noise sampling at the same time. Since the noise exposures were not collected on a systematic or totally random basis, rigorous statistical treatment of the data was not possible. Because only the trends in the data are compared, not specific noise exposures, the comparisons of the current data to published historical data are believed to be valid.

DISCUSSION

Examining table 1 reveals that there is a wide range of sample sizes. The large standard deviations indicate that the range of noise exposures for each occupation varied tremendously. This implies that the mining machines were equipped with various degrees of engineering noise controls and/or that there was a large amount of variation in the work cycles. Furthermore, the large standard deviations make it impossible to accurately predict if an operator would be in compliance with the noise regulations based simply upon the type of equipment he/she operates. Therefore, in order to assign a specific noise exposure to an equipment operator, the actual noise to which the operator is exposed must be measured.

TABLE 1 - MEAN AND STANDARD DEVIATIONS FOR SELECTED OCCUPATIONS

(Refer to Appendix 2 for the Complete Listing)

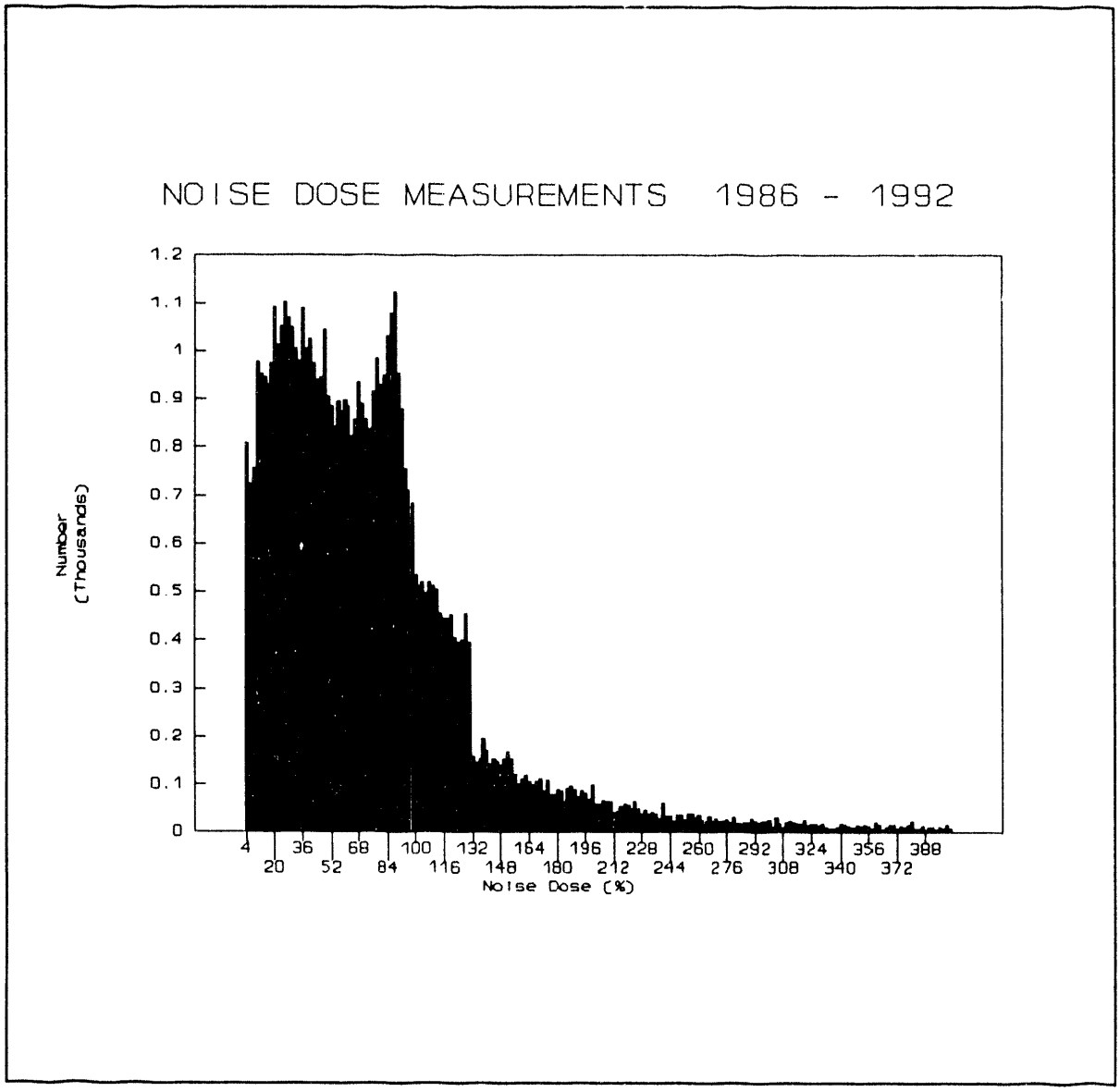
OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
035	CONTINUOUS MINER HELPER	1906	81.6%	47.3%
036	CONTINUOUS MINER OPERATOR	6042	98.9	61.4
044	LONGWALL OPERATOR (TAILGATE)	248	131.8	76.9
064	LONGWALL OPERATOR (HEADGATE)	163	128.2	146.9
070	AUGER OPERATOR	147	148.4	101.2
071	AUGER HELPER	14	91.9	109.7
119	WELDER	14	157.3	262.1
269	MOTORMAN	123	70.2	66.8
310	SCRAPER OPERATOR	669	139.5	214.1
368	BULLDOZER OPERATOR	5204	163.8	218.7

NOTE: The occupation code numbers are broken out by mine location. Numbers 1 through 99 represent Underground Section Workers (FACE), 100 through 199 represent General Underground (Non-Face), 200 through 299 represent Underground Transportation (Non-Face), 300 through 399 represent Surface, 400 through 499 represent Supervisory and Staff, and 500 through 599 represent MSHA and State. Appendix 4 contains a complete alphabetical listing of occupations with their corresponding codes.

By definition, 68 percent of measurements theoretically lie within ± 1 standard deviation of the mean, assuming a normal distribution. When the standard deviation exceeds the mean, the lower limit becomes a negative number. However, because noise exposure cannot be a negative number, the lower limit should be assumed to be 0%. For example, the mean of the scraper operators is 139.5% and the standard deviation is 214.1%. Therefore, the plus/minus one standard deviation for scraper operators becomes 0 to 353.6%

Figure 1 presents a histogram showing the number of samples for given noise exposure ranges. The X-axis represents ranges of ± 1% (range of 1.99%) noise dose centered around the value of the label. For example, the bar labeled "4" displays the number of noise exposure measurements from 3.00% to 4.99% noise dose. It shows a sharp break in the distribution of noise exposures at the 100% and 132% levels. There is currently no explanation for this phenomena. However, it should be noted that excedance of the 100% exposure level indicates that the noise standard has been exceeded. Also, MSHA policy requires that a citation be issued when the results of an inspector's survey equals or exceeds 132%, and effective hearing protective devices were not being used when the noise exposure measurement was being conducted.

FIGURE 1 - DISTRIBUTION OF NOISE EXPOSURES FROM THE ENVIRONMENTAL NOISE FORM DATA BASE



For the sake of clarity, not all of the data has been included in Figure 1. The number of noise dose measurements below 3 percent is 2,592. When this information is included in the graph, the rest of the data became compressed vertically. Also, dose measurements were recorded as high as 1068 percent but in very small numbers. This data was excluded from the graph also to prevent the rest of the data from being compressed horizontally.

COMPARISON WITH OTHER PUBLISHED DATA

Underground Mining Occupations

There are basically two studies which have been conducted to identify the noise exposure of U.S. miners in underground coal mines. These studies are: "Noise in Underground Coal Mines" by Lamonica, Mundell, and Muldoon and "The Noise Environment of the Underground Coal Mine" by Bobick and Giardino.(1,2)[5]

Lamonica, et al. present information from a 21 mine survey where occupational noise exposures were calculated based on partial- and full-shift studies using sound level meters, and the measured operating times at the measured noise levels.(1) This study breaks each occupation into its component parts and provides noise levels for each operating mode. The study presents average and range information for eight occupations. Unfortunately the raw data are not available.

Bobick and Giardino present the results of surveys conducted at 12 underground coal mines encompassing over 2600 employees where occupational noise exposures were calculated based on partial-shift noise levels and exposure time measurements using sound level meter measurements.(2) The partial-shift measurements were extrapolated to full-shift measurements based on the number of cuts mined. Bobick's Table 10 contrasts the average noise levels that he measured with those measured by Lamonica, et al. in 1970 for the eight selected occupations on an operating mode basis.

Some of Bobick and Giardino's raw data were collected as part of a joint Mining Enforcement and Safety Administration - National Institute for Safety and Health (NIOSH) study. These environmental noise exposure data, including occupation code, were published in Appendix E of "Survey of Hearing Loss in the Coal Mining Industry."(3) The data in the NIOSH study are for 11 mines and also include both underground and surface mining occupations. However, this study concentrated on underground mines. Some of the NIOSH reported environmental noise exposures form a subset of the data reported in the Bobick and Giardino report. The mean and sample standard deviation for the various occupation codes are shown in Appendix 3. These data do not total over 2600 employees because NIOSH only published those data where it had hearing level information.

All the earlier studies were conducted with sound level meters and stop watches while the current study used noise dosimeters. Studies conducted by MSHA have revealed that there is no

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[5] Underlined numbers in parentheses refer to items in the list of references preceding the appendixes.

practical difference in the noise level measured at the microphone positions for noise dosimeters and sound level meters.(4) Differences could be attributed to the inherent increase in accuracy in capturing transient noise level excursions when a dosimeter measurement methodology is used as compared to a sound level meter measurement methodology. However, most difference in the noise exposures is attributed to the occupation not the measuring methodology.

Table 2 presents a comparison of the results of the three cited studies with the current one. The occupations, wherever possible, were classified on the same basis. Generally the recent noise exposures collected by the CMS&H inspectors exceeded the earlier measured noise exposures. This may be due to the inspectors targeting the individuals with the higher noise exposures. However, all studies show similar rankings of the occupations for the highest to lowest average noise exposure. This is remarkable considering the variations in sample size, mean exposures, and time span between studies.

Lamonica, et al. and Bobick and Giardino estimated the noncompliance rate to the noise regulations for selected coal mining occupations. The term "noncompliance" is defined as a noise exposure measurement that exceeds the allowable standard (100%). Table 3 presents this data and compares it to the current study. The rate of noncompliance has changed drastically over the time span. This may be due to the very small sample sizes in the earlier studies and/or the noise exposure measurement methodology.

Furthermore, the rate of noncompliance for underground miners was estimated by Bobick and Giardino to be 1.7% of non-face workers and 20.3% for face workers which led Bobick and Giardino to conclude that the rate for all underground workers was 7.2%. This is in contrast with the current rates, based upon inspectors' data, of 7.6%, and 21.6% respectively for non-face and face workers . The percentage of all underground miners subjected to noise exposures above 100% was not computed because the inspectors generally sampled only face occupations. While the percentage of surveyed face workers exposed above 100% has remained fairly constant, the percentage of surveyed non-face workers has greatly increased. The reason for this dramatic increase is unknown; however, it may be explained by the fact that the MSHA inspector data included many more non-face occupations than included in the Bobick and Giardino study. The Bobick and Giardino study concentrated on face workers. The additional non-face occupations could have included those with high noise exposures which were not included in the earlier study (the non-face occupations were not identified in the Giardino and Bobick study) and this would increase the number above 100% dose.

Surface Mining Occupations

Because of the paucity of surface mining noise exposures in the NIOSH data, no valid comparisons between the current study and the former are possible. However, the Bureau of Mines (BOM) funded a study on noise exposures of mobile surface coal mining equipment operators.(5) The results of this study indicated that almost 40% of the mobile equipment operators at surface coal mines have noise exposures which exceed 100%. Table 4 compares the results of the current study with the BOM study and the NIOSH study. The NIOSH data is only included for completeness.

The differences between the BOM and MSHA studies are remarkable. The BOM study generally found much higher noise exposures than the current study. During the intervening years, engineering noise controls have been developed and implemented, perhaps only as optional equipment, for surface mining machines. These controls have become more prevalent in surface mining with the gradual phase out of non-noise controlled machines.

TABLE 2 - COMPARISON OF AVERAGE NOISE EXPOSURES AMONG STUDIES FOR SELECTED UNDERGROUND MINING OCCUPATIONS

OCCUPATION	OCCUP. CODES	ENF MEAN (SD) [N]	NIOSH MEAN (SD) [N]	BOBICK, et al. AVERAGE (RANGE) [N]	LAMONICA et al. AVERAGE (RANGE) [N]
STOPER	(1)	(1)	(1)	1796.0% NS 11	764.0% 394,-INF% 9
CONTINUOUS MINER	036	98.9% 61.4% 6042	86% 47.0% 31	84.0% NS 18	115.0% 11-264% 17
ROTARY DRILL	(2)	(2)	(2)	32.0% NS 37	70.0% 50-151% 12
SHUTTLE CAR	050	56.7% 38.6% 4608	23.2% 15.0% 40	0.0% NS 47	28.0% 9-72% 8
CUTTING MACHINE	038	76.4% 37.9% 1019	42.7% 18.0% 11	37.0% NS 17	51.0% 27-72% 5
COAL DRILL	034	57.9% 45.1% 1044	12.8% 9.0% 11	0.0% NS 17	41% 12-75% 3
LOADING MACHINE	043	107.2% 63.7% 454	130.0% 90% 13	106% NS 18	113% 43-193% 8
LONGWALL SHEAR	044	131.8% 76.9% 248	34.5% 29.0% 2	0.0% NS 2	NI

NOTE: NS=Not Specified. Variations were computed for various modes of operation in this study, but not for the total exposure.

NI=Not included in the study.

(1) Due to the excessive noise levels produced by stoper drills, they were removed from general usage in the mines. Stoper drills cannot be separated from other general roof bolting occupation codes.

(2) Rotary Drills could not be separated from the general roof bolting occupation codes.

TABLE 3 - COMPARISON OF THE OVEREXPOSURE STATUS OF SELECTED UNDERGROUND MINING OCCUPATIONS

OCCUPATION	OCCUP. CODES	ENF % >100%	NIOSH % >100%	BOBICK, et al. % >100%	LAMONICA et al. % >100%
STOPER	(1)	(1)	(1)	100.0	100.0
CONTINUOUS MINER	036	40.6	35.5	33.3	47.0
ROTARY DRILL	(2)	(2)	(2)	5.4	40.7
SHUTTLE CAR	050	9.1	0.0	0.0	0.0
CUTTING MACHINE	038	23.4	0.0	0.0	0.0
COAL DRILL	034	12.7	0.0	0.0	0.0
LOADING MACHINE	043	48.7	46.2	33.3	50.0
LONGWALL SHEAR	044	59.3	0.0	0.0	NI

NI=Not included in the study.

(1) Due to the excessive noise levels produced by stoper drills, they were removed from general usage in the mines. Stoper drills cannot be separated from other general roof bolting occupation codes.

(2) Rotary Drills could not be separated from the general roof bolting occupation codes.

TABLE 4 - COMPARISON OF THE OVEREXPOSURE STATUS OF SELECTED SURFACE MINING OCCUPATIONS

OCCUPATION	OCCUP. CODES	ENF % >100% (N)	BOM % >100%	NIOSH % >100% (N)
BULLDOZER	368	47.8 5204	77.3	25.0 4
FRONT END LOADER	382	17.9 5902	44.5	50.0 2
HAULAGE TRUCK	386 376	15.8 3176	23.0	0.0 8
SCRAPER	310	37.8 669	45.3	NI
SHOVELS & DRAGLINES	367 378 391	13.8 773	33.0	0.0 3
BLAST HOLE DRILLS	384	30.0 1485	12.2	NI
AUGER	370	78.7 334	48.0	NI
ROAD GRADER	375	14.7 361	46.3	0.0 2

NOTE: NI=Not included in the study.
The number of samples for the BOM data was not reported.

CONCLUSIONS

The mean and standard deviation of the noise exposures presented for the various occupation codes, indicate a high degree of variability in the noise exposures found in surface and underground coal mining operations both within and between occupations.

Figure 1 shows a sharp break in the distribution of noise exposures at the 100% and 132% levels. Currently there is no explanation for this discontinuity.

The percentage of surveyed underground face workers who are subjected to noise exposures above 100% dose has remained constant over the past 15 to 20 years. On the other hand, in most cases, the percentage of surveyed surface mobile equipment operators that exceed 100% dose has decreased over the same time interval. Without taking into account any protective factor attributed to the wearing of hearing protective devices, the percentage of miners surveyed that were subjected to noise exposures above 100% dose is 21.6% of underground face workers and is 26.6% for surface miners.

Based upon inspection surveys, the percentages of the miners surveyed that exceed 100% dose for surface occupations has decreased dramatically. This was not the situation with underground occupations. The percentage of face workers surveyed who are exposed above 100% dose has remained relatively constant. However, the measured exposure of non-face workers that were surveyed has increased substantially.

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APPENDIX 1

ENVIRONMENTAL NOISE REPORT FORM

(MSHA 2000-84 FORM)

Environmental Noise Report

U.S. Department of Labor
Mine Safety and Health Administration

A. Mine ID Number	B. Mine Name	C. Company Name		
–				
D. MMU/Pit/Area ID Number	E. Average Production	F. Signature of AR	G. AR Number	H. Field Office No.

I. Survey Date	Mo	Da	Yr	Mo	Da	Yr	Mo	Da	Yr	Mo	Da	Yr	Mo	Da	Yr	Mo	Da	Yr
J. Instrument Type																		
K. Instrument Property Number																		
L. Calibrator Property Number																		
M. Occupation Code																		
N. Machine Code																		
O. Manufacturers Code																		
P. Time Stop																		
Q. Time Start																		
R. Total Survey Time (minutes)																		
S. Production this Shift																		
T. Noise Dosage (percent)																		
U. NRR Value (if PHP considered)																		
V. Adjusted Dosage (if PHP considered)																		
W. Calibration/Check (Yes or No)	Before	After		Before	After		Before	After		Before	After		Before	After		Before	After	
X. Citation Number (if issued)																		

Y. Comments:

MSHA Form 2000-84, Mar 86 (Revised)

Manufacturer Codes

001	Abex
002	Acker
003	Acme
004	Advance Mining
005	Aerodyne
006	Allen -Sherman–Hoff
007	Allis–Chalmers Bulldozer & Fiat
008	Alpine
009	American Hoist
010	Atlas–Copco
011	Baldwin - Lima–Hamilton
012	Barber–Greene
013	Betti
014	Black & Decker
015	Bucyrus - Erie (BE)
016	Buffalo – American
017	Case
018	Caterpillar (cat)
019	Cedar Rapids
020	Chevrolet
021	Chicago Pneumatic
022	Clark
023	Cline
024	Coeur d'Alenes
025	Cushman
026	Dart
027	Demag
028	Deutz
029	Dorr–Oliver
030	Dravo
031	Eaton
032	Eickhoff
033	Eimco
034	Elkhorn
035	Emaco
036	Epling
037	Euclid (uke)
038	Fairchild
039	Fletcher
040	FMC & Link Belt

Manufacturer Codes

041	Ford
042	Fuller
043	Galis FM Calso
044	Gardner–Denver
045	General Electric
046	GMC (Jimmy)
047	Goodman
048	Gorman–Rupp
049	Gradeall
050	Grundlach
051	Harnischfeger & P&H
052	Hewitt–Robins
053	Ingersol–Rand
054	Insley
055	International Harvester (IH) (Hough)
056	Jeffrey–Dresser
057	Jo'd
058	Joy
059	Kenworth
060	Kersey
061	Kobota
062	Koehring
063	Komatsu
064	Kress
065	Krupp
066	Lee–Norse
067	Long - Airdox
068	Mack (bulldog)
069	Manitowoc
070	Marion
071	Marathon Le Tourneau
072	Massey–Ferguson
073	McLanahan
074	Mescher
075	Michigan
076	Mine Equipment Co.
077	Mining Progress Inc.
078	Myers–Whaley
079	Nagle
080	National Mine Service

Manufacturer Codes

081	Nolan
082	Nordberg & Rexnord
083	Northwest
084	Orenstein & Kopper
085	Oshkosh
086	Owens
087	Page
088	Penndrill
089	Pioneer
090	Plymouth–Locomotor
091	Raygo
092	Richmond
093	Ripco
094	Robbins
095	Rosco
096	Royal
097	Salem
098	S & S
099	Schramm
100	Schroder
101	Stacy
102	Stamler
103	Symons
104	Telsmith
105	Terex
106	Unit Rig Equipment Co.
107	Universal
108	Wabco
109	Wagner
110	Warner Swassey
111	Westfalia
112	Westinghouse
113	White
114	Wilcox
115	Wilfley
116	Winter–weiss
117	Wirth
118	Yale
119	Not on this list
120	Unknown

Equipment Codes

01	Air Compressor
02	Auger Miner (UG or S)
03	Bulldozer
04	Classifier, Cyclone
05	Coal, Face Drill
06	Continuous Miner (ripper)
07	Continuous Miner (borer)
08	Conveyor (all types)
09	Crane (all types)
10	Crusher, Breaker
11	Cutting Machine
12	Dragline
13	Dredge
14	Elevator, Hoist
15	Fan (fixed or auxiliary)
16	Flotation & Filters
17	Forklift
18	Front End Loader, Highlift
19	Gunite Machine
20	Hand Tools
21	Highwall Drill
22	Hydraulic Jets
23	L–H–D (surface)
24	Loading Machine
25	Locomotive (UG or S)
26	Longwall Plow
27	Longwall Shear
28	Roadgrader
29	Rockdusting Machine
30	Roof Bolting Machine
31	Rotary Bucket Excavator
32	Rotary Dump
33	Scraper, Pan
34	Screen
35	Shovel (not dragline)
36	Shuttle Car (diesel)
37	Shuttle Car (electric)
38	Tractor, Scoop
39	Truck
40	Not on this list
41	Unknown

U.S. GOVERNMENT PRINTING OFFICE 1990–833 049

APPENDIX 2

NOISE EXPOSURES FOR VARIOUS COAL MINE UNDERGROUND AND SURFACE OCCUPATIONS BASED ON MSHA INSPECTOR DATA FY-86 THROUGH FY-92

(MSHA 2000-84 FORM)

UNDERGROUND SECTION WORKERS (FACE)

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
1	BELT/CONVEYOR MAN	252	57.7%	57.4%
2	ELECTRICIAN	146	34.9	25.9
3	ELECTRICIAN HELPER	2	46.1	30.3
4	MECHANIC	296	42.8	41.4
7	BLASTER/SHOOTER/ SHOTFIRER	142	34.4	24.9
8	STOPPING BUILDER/ MASON	13	35.1	36.3
9	SUPPLY MAN	51	48.5	45.7
10	AUGER (JACK SETTER-INTAKE)	85	139.8	119.7
11	WIREMAN	2	31.5	13.3
12	ROOF BOLTER (TWIN INTAKE)	1291	73.5	57.6
13	CLEAN UP MAN	12	49.5	33.8
14	ROOF BOLTER (TWIN-RETURN)	1189	71.2	44.0
16	LABORER	85	49.3	48.7
17	AUGER (TIMBERMAN-RETURN)	53	179.4	129.3
18	AUGER (TIMBERMAN-INTAKE)	47	165.6	138.8
19	ROOF BOLTER (MOUNTED-INTAKE)	138	86	53.9
31	SHOTFIRER HELPER	13	48.8	22.6
32	BRATTICE MAN	36	48.1	40.0

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
33	COAL DRILL HELPER	30	65.6%	49.8%
34	COAL DRILL OPERATOR	1044	57.9	45.1
35	CONTINUOUS MINER HELPER	1906	81.6	47.3
36	CONTINUOUS MINER OPERATOR	6042	98.9	61.4
37	CUTTING MACHINE HELPER	124	70.2	49.5
38	CUTTING MACHINE OPERATOR	1019	76.4	37.9
39	HAND LOADERS	323	22.0	37.2
40	HEADGATE OPERATOR	284	101.8	56.5
41	JACK SETTER (LONGWALL)	381	76.2	45.6
42	LOADING MACHINE HELPER	16	79.9	30.5
43	LOADING MACHINE OPERATOR	454	107.2	63.7
44	LONGWALL OPERATOR (TAILGATE)	248	131.8	76.9
45	ROCKMAN	11	224.4	354.5
46	ROOF BOLTER (SINGLE)	5709	72.3	47.0
47	ROOF BOLTER HELPER (SINGLE)	454	55.0	34.6
48	ROOF BOLTER (MOUNTED-RETURN)	208	88.2	60.9
49	SECTION FOREMAN	314	52.0	37.6
50	SHUTTLE CAR OPERATOR (STANDARD)	4608	56.7	38.6

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
51	STALL DRIVER	5	75.8	49.3
52	TAILGATE OPERATOR	46	80.9	53.3
53	UTILITY MAN	350	48.6	38.6
54	SCOOP CAR OPERATOR	2218	45.4	31.8
55	AUGER (JACK SETTER-RETURN)	70	163.5	123.1
60	LONGWALL (FACE WORKER)	3	53.6	46.5
64	LONGWALL OPERATOR (HEADGATE)	163	128.2	146.9
70	AUGER OPERATOR	147	148.4	101.2
71	AUGER HELPER	14	91.9	109.7
72	MOBILE BRIDGE OPERATOR	659	83.9	54.3
73	SHUTTLE CAR OPERATOR (OFF STANDARD)	1731	54.2	36.9
74	TRACTOR OPERATOR/MOTORMAN	321	55.7	45.2

GENERAL UNDERGROUND (NON-FACE)

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSAGE (%)	SAMPLE STANDARD DEVIATION
101	BELT/CONVEYOR MAN	249	44.1	42.5
102	ELECTRICIAN	11	32.8	16.2
104	MECHANIC	70	34.4	28.5
106	ROCK DUSTER	9	39.7	20.6
108	STOPPING BUILDER	44	23.7	20.4
109	SUPPLY MAN	97	53.3	42.2
110	TIMBER MAN	79	27.7	21.6
111	WIREMAN	3	6.1	10.6
113	CLEANUP MAN	2	53.0	35.4
114	COAL SAMPLER	2	61.6	72.9
116	LABORER	44	35.6	28.9
119	WELDER	14	157.3	262.1
122	COAL DUMP OPERATOR	16	23.1	21.3
146	ROOF BOLTER	5	24.1	20.6
149	BULLGANG/LABOR FOREMAN	4	29.2	17.9
154	BELT CLEANER	144	43.0	36.3
156	ROCK DRILLER	2	778.1	936.1
157	PUMPER	41	23.5	18.9
158	ROCK MACHINE OPERATOR	2	21.5	23.4
160	SHOPMAN	2	31.9	31.5

UNDERGROUND TRANSPORTATION (NON-FACE)

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
201	BELT/CONVEYOR MAN	25	49.7	43.9
216	TRACKMAN	12	18.8	11.3
221	HOISTMAN	3	38.3	25.7
262	BRAKEMAN	2	13.8	13.8
265	DISPATCHER	2	7.9	9.5
269	MOTORMAN	123	70.2	66.8

SURFACE

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
301	CONVEYOR OPERATOR	89	61.6	77.6
302	ELECTRICIAN	329	51.9	60.4
303	ELECTRICIAN HELPER	3	115.3	134.0
304	MECHANIC	1202	44.0	53.0
305	MECHANIC HELPER	56	42.0	51.8
306	WELDER (NON-SHOP)	84	45.6	42.9
307	BLASTER/SHOTFIRER	63	32.2	28.7
308	MASON	7	139.2	120.1
309	SUPPLYMAN	89	32.0	29.3
310	SCRAPER OPERATOR	669	139.5	214.1
312	BELT VULCANIZER	5	93.5	85.4
313	CLEANUP MAN	267	93.8	92.3
314	COAL SAMPLER	183	41.9	50.1
315	FAN ATTENDANT	3	100.1	18.4
316	LABORER/BLACKSMITH	1020	80.2	116.4
318	OILER/GREASER	559	131.7	166.8
319	WELDER (SHOP)	192	44.6	49.9
320	CAGE ATTENDANT/CAGER	9	162.2	166.2
321	HOIST ENGINEER/OPERATOR	295	20.2	28.7
322	COAL STRIP OPERATOR	12	43.8	50.8
323	TRANSIT MAN	2	56.4	79.7
324	BACKHOE OPERATOR	237	56.0	58.9
325	DIESTER TABLE OPERATOR	33	72.2	50.0

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
326	FORKLIFT OPERATOR	57	40.0	33.9
327	PUMPER	35	72.1	54.7
328	UTILITY MAN	337	76.0	136.0
329	VACUUM FILTER OPERATOR	29	129.5	110.1
331	CLAM OPERATOR	9	80.6	79.3
333	COAL DRILL HELPER	4	237.2	323.5
334	COAL DRILL OPERATOR	25	59.3	51.3
340	BOOM OPERATOR	27	54.1	63.3
341	BELT/CONVEYOR MAN	157	69.5	70.4
342	BIT SHARPENER	12	58.7	114.3
343	CAR TRIMMER/CAR LOADER	229	33.4	43.6
344	CAR SHAKE-OUT OPERATOR	26	358.2	361.7
345	CRUSHER ATTENDANT	173	96.1	158.4
347	FROTH CELL OPERATOR	64	123.5	82.1
348	MACHINIST	77	25.2	65.9
349	ROTARY DUMP OPERATOR	17	67.3	102.2
350	SHUTTLE CAR OPERATOR	4	50.8	33.7
351	SCOOP OPERATOR	12	125.4	159.6
352	STEEL WORKER	6	35.1	25.2
354	SWEEPER OPERATOR	8	64.7	44.2
356	ROCK DRILLER	41	97.5	137.7
357	WASHER OPERATOR	199	116.6	111.2
358	WATER CIRCUIT OPERATOR	18	114.2	125.6
359	COMPACTOR OPERATOR	2	55.5	61.5

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
360	SHOPMAN REPAIR CARS	11	98.7	146.6
362	BRAKEMAN	14	65.9	55.8
365	DISPATCHER	6	12.1	16.1
367	COAL SHOVEL OPERATOR	171	56.0	57.5
368	BULLDOZER OPERATOR	5204	163.8	218.7
369	MOTORMAN OPERATOR	47	33.2	28.2
370	AUGER OPERATOR	334	233.7	192.5
371	AUGER HELPER	271	200.9	135.0
372	BARGE ATTENDANT	90	39.3	41.5
373	CAR DROPPER	325	38.9	44.3
374	CLEANING PLANT OPERATOR	646	86.4	98.1
375	ROAD GRADER OPERATOR	361	59.0	71.9
376	COAL TRUCK DRIVER	616	60.7	81.7
378	CRANE/DRAGLINE OPERATOR	471	60.3	95.8
379	DRYER OPERATOR	105	56.1	54.2
380	FINE COAL PLANT OPERATOR	370	108.2	80.7
381	HOIST OPERATOR HELPER	6	52.9	27.8
382	HIGH LIFT/FEL OPERATOR	5902	68.3	81.0
383	HIGHWALL DRILL HELPER	64	86.6	118.9

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
384	HIGHWALL DRILL OPERATOR	1485	90.3	112.6
385	LAMPMAN	42	19.5	29.3
386	REFUSE/BACKFILL TRUCK DRIVER	2560	63.7	75.7
387	ROTARY BUCKET OPERATOR	55	63.6	73.8
388	SCALPER-SCREEN OPERATOR	222	158.8	167.3
390	SILO OPERATOR	22	76.7	86.2
391	STRIPPING SHOVEL OPERATOR	131	58.4	91.8
392	TIPPLE OPERATOR	1260	81.0	167.1
393	WEIGHMAN	148	20.4	39.6
394	CARPENTER	8	71.8	37.9
395	WATER TRUCK OPERATOR	59	74.7	114.2
396	WATCHMAN	3	47.0	47.3
397	YARD ENGINE OPERATOR	17	45.3	43.2
398	GROUNDMAN	45	54.1	36.0

SUPERVISORY AND STAFF

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
402	MASTER ELECTRICIAN	2	10.7	6.1
418	MAINTENANCE FOREMAN	9	37.6	38.2
430	ASSISTANT MINE MANAGER	13	53.6	37.6
449	MINE MANAGER	95	43.8	74.2
456	ENGINEER	7	28.5	12.8
462	FIRE BOSS EXAMINER	12	27.6	22.8
464	INSPECTOR	19	14.8	13.1
481	SUPERINTENDENT	30	40.5	46.5
489	OUTSIDE FOREMAN	56	41.4	26.2
494	PREPARATION PLANT FOREMAN	106	59.4	80.3
495	SAFETY DIRECTOR	3	61.1	30.6
496	UNION REPRESENTATIVE	3	42.5	39.5
497	CLERK/TIMEKEEPER	7	15.7	13.6

APPENDIX 3

NOISE EXPOSURES FOR VARIOUS COAL MINE UNDERGROUND AND SURFACE OCCUPATIONS BASED ON MSHA DATA PUBLISHED BY NIOSH

EXTRACTED FROM: Appendix E of

"SURVEY OF HEARING LOSS in the COAL MINING INDUSTRY"

HEW PUBLICATION NO. (NIOSH) 76-172

1976

UNDERGROUND SECTION WORKERS (FACE)

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
1	BELT/CONVEYOR MAN	5	24.6	22.6
2	ELECTRICIAN	5	10.2	14
3	ELECTRICIAN HELPER	2	2.0	3.0
4	MECHANIC	7	21.0	18.0
5	MECHANIC HELPER	1	38.0	*
6	ROCK DUSTER	1	41.0	*
7	BLASTER/SHOOTER/ SHOTFIRER	4	20.8	17.0
8	STOPPING BUILDER/MASON	2	2.5	3.5
9	SUPPLY MAN	2	40.0	13.0
10	AUGER (JACK SETTER-INTAKE)	9	26.6	26.0
11	WIREMAN	2	21.0	29.0
16	ROOF BOLTER (TWIN-INTAKE)	2	0.0	0.0
32	BRATTICE MAN	5	21.4	20.0
34	COAL DRILL OPERATOR	11	12.8	9.0
35	CONTINUOUS MINER HELPER	21	97.5	42.0
36	CONTINUOUS MINER OPERATOR	31	86.0	47.0
38	CUTTING MACHINE OPERATOR	11	42.7	18.0
41	JACK SETTER (LONGWALL)	2	7.0	10.0
42	LOADING MACHINE HELPER	4	58.0	28.0

NOTE: AN ASTERISK (*) DENOTES THAT A STANDARD DEVIATION CANNOT BE CALCULATED DUE SAMPLE SIZE OF ONE.

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
43	LOADING MACHINE OPERATOR	13	130.0	90.0
44	LONGWALL OPERATOR (TAILGATE)	2	34.5	29.0
45	ROCKMAN	1	0.0	*
46	ROOF BOLTER (SINGLE)	38	618.1	1168.5
47	ROOF BOLTER HELPER (SINGLE)	1	37.0	*
48	ROOF BOLTER (MOUNTED RETURN)	9	630.6	592.9
49	SECTION FOREMAN	8	36.8	22.0
50	SHUTTLE CAR OPERATOR (STANDARD)	40	23.2	15.0
51	STALL DRIVER	1	14.0	*
52	TAILGATE OPERATOR	1	14.0	*
53	UTILITY MAN	6	28.0	16.4
60	LONGWALL (FACE WORKER)	2	21.0	29.0
62		1	0.0	*

GENERAL UNDERGROUND (NON-FACE)

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
101	BELT/CONVEYOR MAN	6	16.0	14.0
102	ELECTRICIAN	4	2.0	4.0
104	MECHANIC	8	18.0	19.5
105	MECHANIC HELPER	4	24	21.0
106	ROCK DUSTER	1	25.0	*
108	STOPPING BUILDER	5	5.0	6.0
109	SUPPLY MAN	5	19.4	22.0
110	TIMBER MAN	2	81.0	3.5
111	WIREMAN	5	7.4	8.0
116	LABORER	7	13.0	23.2
117	RODMAN	2	3.5	5.0
118	OILER/GREASER	3	11.0	16.0
119	WELDER	1	0.0	*
122	COAL DUMP OPERATOR	2	8.0	11.3
123	TRANSIT MAN	1	0.0	*
136		1	4.0	*
143		1	4.0	*
149	BULLGANG/LABORER FOREMAN	2	0.0	0.0
150		1	4.0	*
154	BELT CLEANER	4	36.0	23.0
155	CHAINMAN	1	16.0	*
157	PUMPER	4	5.0	4.0
158	ROCK MACHINE OPERATOR	3	78.3	88.0

UNDERGROUND TRANSPORTATION (NON-FACE)

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
201	BELT/CONVEYOR MAN	3	13.0	22.5
216	TRACKMAN	5	40.2	77.0
220	CAGER	1	0.0	*
262	BRAKEMAN	3	0.0	0.0
265	DISPATCHER	4	2.0	4.0
269	MOTORMAN	7	64.0	52.0

SURFACE

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
301	CONVEYOR OPERATOR	1	0.0	*
302	ELECTRICIAN	6	0.0	0.0
303	ELECTRICIAN HELPER	1	0.0	*
304	MECHANIC	7	0.0	0.0
305	MECHANIC HELPER	2	0.0	0.0
308	MASON	1	0.0	*
309	SUPPLY MAN	4	0.0	0.0
314	COAL SAMPLER	1	0.0	*
315	FAN ATTENDANT	1	0.0	*
316	LABORER/BLACKSMITH	5	0.0	0.0
319	WELDER (SHOP)	4	0.0	0.0
321	HOIST ENGINEER/OPERATOR	2	0.0	0.0
322	COAL STRIP OPERATOR	2	0.0	0.0
340	BOOM OPERATOR	1	0.0	*
356	ROCK DRILLER	1	75.0	*
360	SHOPMAN REPAIR CARS	1	0.0	*
368	BULLDOZER OPERATOR	4	82.0	48.0
373	CAR DROPPER	5	303.2	678.0
374	CLEANING PLANT OPERATOR	4	200.5	229.2
375	ROAD GRADER OPERATOR	2	25.0	35.0
376	COAL TRUCK DRIVER	4	33.0	42.0
378	CRANE/DRAGLINE OPERATOR	2	33.0	46.0

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
379	DRYER OPERATOR	1	0.0	*
380	FINE COAL PLANT OPERATOR	1	0.0	*
382	HIGH LIFT/FEL OPERATOR	2	93.0	80.6
385	LAMPMAN	5	0.0	0.0
386	REFUSE/BACKFILL TRUCK DRIVER	4	32.0	22.0
388	SCALPER-SCREEN OPERATOR	2	41.0	4.2
391	STRIPPING SHOVEL OPERATOR	1	75.0	*
392	TIPPLE OPERATOR	6	16.8	41.2
394	CARPENTER	1	0.0	*

SUPERVISORY AND STAFF

OCCUP. CODE	OCCUPATION	SAMPLE SIZE	MEAN DOSE (%)	SAMPLE STANDARD DEVIATION
402	MASTER ELECTRICIAN	3	0.0	0.0
404	MASTER MECHANIC	1	0.0	*
414	DUST SAMPLER	2	0.0	0.0
418	MAINTENANCE FOREMAN	4	0.0	0.0
423	SURVEYOR	1	0.0	*
430	ASSISTANT MINE MANAGER	7	2.3	6.1
449	MINE MANAGER	6	2.7	6.5
456	ENGINEER	1	0.0	*
462	FIRE BOSS EXAMINER	4	1.8	3.5
464	INSPECTOR	2	0.0	0.0
481	SUPERINTENDENT	6	2.7	6.5
485		2	0.0	0.0
489		3	0.0	0.0
494	PREPARATION PLANT FOREMAN	1	0.0	*
497	CLERK/TIMEKEEPER	2	0.0	0.0

APPENDIX 4

ALPHABETICAL LIST OF OCCUPATIONS AND CODE NUMBERS

Source: MSHA Handbook Series
PH 89-V-1

February 15, 1989

CODES 001-099	UNDERGROUND SECTION WORKERS (FACE)
CODES 101-199	GENERAL UNDERGROUND (NON-FACE)
CODES 201-299	UNDERGROUND TRANSPORTATION (NON-FACE)
CODES 301-399	SURFACE
CODES 401-499	SUPERVISORY AND STAFF
CODES 501-599	MSHA/STATE

OCCUPATION	CODE
ASSISTANT MINE MANAGER	430
AUGER HELPER	071
AUGER HELPER	371
AUGER OPERATOR	070
AUGER OPERATOR	370
AUGER(JACK SETTER-INTAKE)	010
AUGER(JACK SETTER-RETURN)	055
AUGER(TIMBERMAN-INTAKE)	018
AUGER(TIMBERMAN-RETURN)	017
BACKHOE OPERATOR	324
BARGE ATTENDANT	372
BATTERY STATION OPERATOR	261
BELT CLEANER	154
BELT VULCANIZER	112
BELT VULCANIZER	312
BELT/CONVEYOR MAN	001
BELT/CONVEYOR MAN	101
BELT/CONVEYOR MAN	201
BELT/CONVEYOR MAN	341
BIT SHARPENER	342
BLASTER/SHOOTER/SHOTFIRER	007
BLASTER/SHOTFIRER	307
BOOM OPERATOR	340
BRAKEMAN	262
BRAKEMAN	362
BRATTICE MAN	032
BUGGY PUSHER	277
BULLDOZER OPERATOR	368

OCCUPATION	CODE
BULLGANG/LABOR FOREMAN	149
CAGE ATTNEDANT/CAGER	320
CAGER	220
CAR DROPPER	373
CAR SHAKE-OUT OPERATOR	344
CAR TRIMMER/CAR LOADER	343
CARPENTER	394
CHAINMAN	155
CHAINMAN	355
CLAM OPERATOR	331
CLEAN UP MAN	013
CLEANING PLANT OPERATOR	374
CLEANUP MAN	113
CLEANUP MAN	313
CLERK/TIMEKEEPER	497
COAL DRILL HELPER	033
COAL DRILL HELPER	333
COAL DRILL OPERATOR	034
COAL DRILL OPERATOR	334
COAL DUMP OPERATOR	122
COAL SAMPLER	114
COAL SAMPLER	314
COAL SHOVER OPERATOR	367
COAL STRIP OPERATOR	322
COAL TRUCK DRIVER	376
COMPACTOR OPERATOR	359
CONTINUOUS MINER HELPER	035
CONTINUOUS MINER OPERATOR	036
CONVEYOR OPERATOR	301

OCCUPATION	CODE
CRANE/DRAGLINE OPERATOR	378
CRUSHER ATTNEDANT	345
CUTTING MACHINE HELPER	037
CUTTING MACHINE OPERATOR	038
DIESTER TABLE OPERATOR	325
DISPATCHER	265
DISPATCHER	365
DRIVER	276
DRYER OPERATOR	379
DUST SAMPLER	414
EDUCATION SPECIALIST	590
ELECTRICIAN	002
ELECTRICIAN	102
ELECTRICIAN	302
_LECTRICIAN HELPER	003
ELECTRICIAN HELPER	103
ELECTRICIAN HELPER	303
ENGINEER	456
FAN ATTENDANT	115
FAN ATTENDANT	315
FAN ATTNEDANT	015
FINE COAL PLANT OPERATOR	380
FIRE BOSS EXAMINER	462
FORKLIFT OPERATOR	326
FROTH CELL OPERATOR	347
GROUNDMAN	398
HAND LOADERS	039
HEADGATE OPERATOR	040
HIGH LIFT/FEL OPERATOR	382

OCCUPATION	CODE
HIGHWALL DRILL HELPER	383
HIGHWALL DRILL OPERATOR	384
HOIST ENGINEER/OPERATOR	321
HOIST OPERATOR HELPER	381
HOISTMAN	221
INDUSTRIAL SAFETY OFFICER	591
INSPECTOR	464
JACK SETTER(LONGWALL)	041
LABORER	016
LABORER	116
LABORER/BLACKSMITH	316
LAMPMAN	385
LOADER	240
LOADING MACHINE HELPER	042
LOADING MACNINE OPERATOR	043
LONGWALL - FACE WORKER	060
LONGWALL - FIXED POSITION	061
LONGWALL OPERATOR(HEADGATE)	064
LONGWALL OPERATOR(TAILGATE)	044
MACHINIST	348
MAINTNEANCE FOREMAN	418
MASON	308
MASTER ELECTRICAIN	402
MASTER MECHANIC	404
MECHANIC	004
MECHANIC	104
MECHANIC	304
MECHANIC HELPER	005
MECHANIC HELPER	105

OCCUPATION	CODE
MECHANIC HELPER	305
MINE MANAGER	449
MINE SAFETY INSTRUCTOR	592
MOBILE BRIDGE OPERATOR	072
MOTORMAN	269
MOTORMAN OPERATOR	369
OILER/GREASER	118
OILER/GREASER	318
OUTSIDE FOREMAN	489
PREPERATION PLANT FOREMAN	494
PUMPER	157
PUMPER	327
REFUSE/BACKFILL TRUCK DRIVER	386
ROAD GRADER OPERATOR	375
ROAD ROLLER OPERATOR	377
ROCK DRILLER	156
ROCK DRILLER	356
ROCK DUSTER	006
ROCK DUSTER	106
ROCK MACHINE OPERATOR	158
ROCKMAN	045
RODMAN	117
RODMAN	317
ROOF BOLTER	146
ROOF BOLTER HELPER(SINGLE)	047
ROOF BOLTER(MOUNTED-INTAKE)	019
ROOF BOLTER(MOUNTED-RETURN)	048
ROOF BOLTER(SINGLE)	046
ROOF BOLTER(TWIN-INTAKE)	012

OCCUPATION	CODE
ROOF BOLTER(TWIN-RETURN)	014
ROTARY BUCKET OPERATOR	387
ROTARY DUMP OPERATOR	349
SAFETY DIRECTOR	495
SAFETY REPRESENTATIVE	593
SCALPER-SCREEN OPERATOR	388
SCOOP CAR OPERATOR	054
SCOOP OPERATOR	351
SCRAPER OPERATOR	310
SECTION FORMAN	049
SHOPMAN	160
SHOPMAN REPAIR CARS	360
SHOTFIRER HELPER	031
SHUTTLE CAR OP(OFF STANDARD)	073
SHUTTLE CAR OP(STANDARD)	050
SHUTTLE CAR OPERATOR	250
SHUTTLE CAR OPERATOR	350
SILO OPERATOR	390
STALL DRIVER	051
STEEL WORKER	352
STOPPING BUILDER	108
STOPPING BUILDER/MASON	008
STRIPPING SHOVEL OPERATOR	391
SUPERINTENDENT	481
SUPPLY MAN	009
SUPPLY MAN	109
SUPPLY MAN	309
SURVEYOR	423
SWEEPER OPERATOR	354

OCCUPATION	CODE
TAILGATE OPERATOR	052
TIMBER MAN	110
TIPPLE OPERATOR	392
TRACK FOREMAN	263
TRACK FOREMAN	273
TRACKMAN	216
TRACTOR OPERATOR/MOTORMAN	074
TRAINING SPECIALIST	594
TRANSIT MAN	123
TRANSIT MAN	323
UNION REPRESENTATIVE	496
UTILITY MAN	053
UTILITY MAN	328
VACUUM FILTER OPERATOR	329
WASHER OPERATOR	357
WATCHMAN	396
WATER CIRCUIT OPERATOR	358
WATER LINE MAN	159
WATER TRUCK OPERATOR	395
WATERBOY	366
WEIGHMAN	393
WELDER	119
WELDER(NON-SHOP)	306
WELDER(SHOP)	319
WIREMAN	011
WIREMAN	111
WIREMAN	311
YARD ENGINE OPERATOR	397

DATE
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6/17/94

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