

**NIOSH TECHNICAL REPORT**  
**RESULTS FROM THE NATIONAL OCCUPATIONAL**  
**HEALTH SURVEY OF MINING (NOHSM)**

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## ABSTRACT

The National Occupational Health Survey of Mining (NOHSM) was conducted by the National Institute for Occupational Safety and Health (NIOSH) pursuant to the U.S. Federal Mine Safety and Health Amendments Act of 1977. This Act dictates that the Secretary of Health and Human Services “. . . shall, for each toxic material or harmful physical agent which is used or found in a mine, determine whether such material or agent is potentially toxic at the concentrations in which it is used or found in a mine.”

The three main objectives of this report are: (1) document why and how NOHSM was conducted, for the benefit of future users of the NOHSM database; (2) provide results for most of the types of data which were gathered from NOHSM; and (3) encourage interested parties to use information from the NOHSM database by requesting specific information from the NOHSM project officer or by requesting a copy of the NOHSM PC-based query system.

NIOSH conducted the field portion of NOHSM from May 1984 to August 1989. The survey included a total of 491 mines (60 coal mines and 431 metal-nonmetal mines such as aluminum, gold, sand & gravel, etc.) which employed 59,734 miners, representing 66 mineral commodities. The 491 surveyed mines were selected from a total of 2,131 mines which employed 297,322 miners. Although NIOSH surveyed only a representative sample of mines in each mineral commodity, the data were projected over all of the mines in each of those mineral commodities.

Each mine's survey included three phases: questionnaire, chemical inventory, and worksite visit. The data obtained during the questionnaire described medical services, industrial hygiene practices, and

general facility information. The inventory data identified all chemical substances and trade name products found on the mine property and the annual usage rate of each chemical substance. NIOSH inventoried 2,570 chemical substances and 84,939 trade name products. During the work-site visit, the NOHSM surveyors observed and interviewed workers to determine their potential exposures at the worksite. The term “**potential exposure**” has two criteria. First, the NOHSM surveyor must have determined that the health-related agent was in sufficient proximity to a worker such that the agent could have entered or contacted the body of the worker, although the level of exposure was not measured by NIOSH. Second, the duration of the potential exposure must have met the minimum duration guidelines (i.e., a part-time duration was defined as the potential exposure time which was greater than 30 minutes per week [on an annual average] or at least once per week 90 percent of the weeks of the work year). The potential exposures recorded during the worksite visits included chemical substances; trade name products; physical agents; musculoskeletal overloads; welding, brazing, and soldering processes; abrasive grinding processes; and bulk dust. Workers were often potentially exposed to more than one agent. Therefore, the total projected numbers of potential exposures are often greater than the number of workers in the entire mining industry or in a given mining commodity.

The projected numbers of potential exposures, across the entire mining industry were: physical agents 365,332; musculoskeletal overload conditions 710,340; welding, brazing, and soldering agents 188,852. More than 1.1 million potential exposures to chemicals and trade name substances were found in surface shops, alone. Through the bulk dust samples, approximately 214,000 miners were found to be potentially exposed to dust that contained greater than 5 percent quartz.



# RESULTS FROM THE NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING (NOHSM)

## I. INTRODUCTION

### A. Field Survey Summary

The National Occupational Health Survey of Mining (NOHSM) was designed by the National Institute for Occupational Safety and Health (NIOSH) to characterize health-related agents found at U.S. mines. A sample of mines representing 66 different mineral commodities was surveyed during the period of May 1984 through August 1989. A total of 491 mines were surveyed during that period, including 431 metal-nonmetal mines and 60 coal mines. The 491 surveyed mines employed 59,734 miners.

### B. Previous Similar NIOSH Surveys

NOHSM was similar to two previous NIOSH surveys: the National Occupational Hazard Survey (NOHS) conducted during 1972–1974<sup>1</sup> and the National Occupational Exposure Survey (NOES) conducted during 1981–1982.<sup>2</sup>

### C. NOHSM Purpose

NOHSM was developed in response to the U.S. Federal Mine Safety and Health Amendments Act of 1977 for two reasons. First, the Act required that the Secretary of Health, Education, and Welfare (now the Department of Health and Human Services) “. . . shall, for each toxic material or harmful physical agent which is used or found in a mine, determine whether such material or agent is potentially toxic at the concentrations in which it is used or found in a mine.”<sup>3</sup> In

order to fulfill these requirements of the Act, NIOSH implemented a two-stage plan. The first stage involved the identification of occupational health hazards in the mining industry; the identification of the mining commodities where these occupational health hazards occurred; and the identification of the occupations and the number of workers, by sex, potentially exposed to these occupational health hazards. The second stage, which is not a part of NOHSM, will require air sampling for selected chemicals and dusts to determine the concentrations at which they are used or found. This second-stage effort will rely on information obtained from the first stage in selecting the mining commodities, chemicals, and occupations that are to be sampled. Second, since the Act directed NIOSH to perform research to protect the health of U.S. workers in the mining industry, NIOSH needed to develop a reliable database concerning workers' potential exposures to health hazards. The establishment of this NOHSM database has enabled NIOSH to: (1) estimate the number of miners potentially exposed to occupational health hazards; (2) describe the types of mining commodities and occupational groups where the potential for exposure to these hazards was observed; and (3) document some of mine management's practices and policies toward workers' health.

## II. NOHSM SAMPLE SELECTION

### A. Commodity Adjustments

The NOHSM covered 66 mineral commodities (Table 1). Twenty-one of the Mine Safety and

Health Administration (MSHA) mineral commodities had no active mining facilities during the period of the NOHSM survey; NOHSM combined Aluminum (Mill) and Aluminum (Ore) into one commodity, Aluminum; the 3 Clay commodities designated by MSHA were combined into one NOHSM commodity, Clay. Those adjustments resulted in 66 mineral commodities being surveyed by NOHSM which are shown in Table 2. A few of the 66 commodities used in NOHSM were divided into geographic strata based on differences in mineral composition and mining methods. When NOHSM began some of the mineral commodities had many inactive mines. In order to allow some of these mineral commodities enough time to recover into a more active operating status, NOHSM was divided into 4 segments. The mineral commodities with the highest operating status as compared to the 1980 year-end version of the Address and Employment file that was maintained by MSHA were surveyed in the first segment. The mines that were surveyed in the second segment belong to the mineral commodities that had the highest operating activity status from the remainder of the commodities that were not surveyed in the first segment, etc. NIOSH obtained information on each mine's operating activity status from MSHA-provided computer tapes that were updated on a quarterly basis. The specific tape that was used for the selection of each mineral commodity is provided in Table 3.

## **B. Basis of Mine Selection**

Mines to be surveyed as a part of NOHSM were selected from a file of mining and milling establishments maintained by MSHA. Sample selection was based on each mine's operating status (NIOSH had specified that NOHSM cover mines that had an active operating status), average yearly employment, MSHA's Standard Industrial Classification (SIC), and geographical area. The MSHA SIC is a five digit coding classification for each mineral commodity that MSHA constructed from the four-digit SIC used in the non-mining industries. The MSHA SIC codes and associated mineral commodities are listed in Table 1.

## **C. Systematic Sampling Description**

NOHSM used systematic sampling with replacement. Each mine in the sample was weighted in proportion to its employment level, with a proportionally heavier weighing going to larger employment mines. A test sample interval was calculated by dividing the total number of workers in a commodity by the number of mines to be surveyed for that commodity. The number of mines to be surveyed for a commodity was calculated by multiplying the sampling percent (initially 15 percent of the mines in a commodity were to be sampled, but this was adjusted before the second segment of NOHSM mines were selected so that no more than 30 mines were selected within any commodity) by the total number of mines in that commodity and rounding up. Any mine with an employment level greater than the sample interval had a 100 percent probability of being selected and a chance of being selected more than once; therefore such mines were pre-selected as a self-representing unit (SRU) and removed from the list of all mines in that commodity. A new sample interval was then calculated and systematic sampling was initiated over the remaining mines in that commodity. Mines which were selected with the new sample interval from the sample with the SRUs removed were called non-self-representing units (NSRUs). Data from NSRUs can be projected over the commodity—remaining mines which were not surveyed, while data from the SRUs can only apply to the individual mine selected and can only be added as a constant to obtain the commodity totals. A document entitled "*Final Report on the Sampling Design for the Occupational Health Survey of the Mining Industry*" provides a thorough description of the NOHSM sample selection.<sup>4</sup> The compendium of the resulting sample of mines is found in Appendix A. Any mineral commodity in Appendix A which lists only SRU mining facilities being surveyed means that every mining facility in that mineral commodity was surveyed under NOHSM. In effect, a census of the commodity was performed.

**Table 1**  
**MSHA SIC CODES AND ASSOCIATED MINERAL COMMODITIES**

<b>MSHA SIC CODE</b>	<b>MINERAL COMMODITY</b>	<b>MSHA SIC CODE</b>	<b>MINERAL COMMODITY</b>
28191	Alumina (Mill)**	10990	Metal Ores, NEC+
10510	Aluminum Ore**	14994	Mica
10991	Antimony*	10615	Molybdenum
14591	Aplite	10616	Nickel*
14991	Asbestos	14990	Nonmetallic Minerals, NEC+
14720	Barite	13112	Oil Sand*
10992	Beryl	13111	Oil Shale
14741	Boron Minerals	14995	Peat (Before 1979)*
28193	Bromine*	14996	Perlite
14592	Brucite*	14750	Phosphate Rock
32410	Cement	14792	Pigment Mineral
14790	Chemical and Fertilizer, NEC*+	10993	Platinum Group
10611	Chromite*	14742	Potash
14590	Clay, Ceramic & Refractory, NEC**+	14740	Potash, Soda & Borate Minerals, NEC*+
14550	Clay (Common)**	14997	Pumice
14530	Clay (Fire)**	14793	Pyrites
11110	Coal, Anthracite	10994	Rare Earths
12110	Coal, Bituminous	28991	Salt (Evaporated)
10612	Cobalt*	28992	Salt (In Brine)*
10613	Columbium-Tantalum*	14760	Salt (Rock)
10210	Copper Ore	14410	Sand & Gravel
14593	Feldspar	14292	Sandstone (Crushed & Broken)
10610	Ferrous Ores*	14114	Sandstone (Dimension)
14730	Fluorspar	14596	Shale (Common)
14531	Gamet*	14295	Silica Sand*
14992	Gemstones	10440	Silver Ores
14993	Gilsonite	14293	Slate (Crushed & Broken)
10410	Gold (Lode and Placer)	14115	Slate (Dimension)
14230	Granite (Crushed & Broken)	14744	Sodium Compounds
14111	Granite (Dimension)	14290	Stone, Crushed & Broken, NEC+
14920	Gypsum	14110	Stone, Dimension NEC+
28190	Industrial Chemicals, NEC*+	14794	Strontium*
10110	Iron Ore	14770	Sulfur*
14594	Kyanite	14960	Talc, Soapstone & Pyrophyllite
10310	Lead and/or Zinc Ore	10995	Tin Ore*
29900	Leonardite	10996	Titanium
32740	Lime	14294	Traprock (Crushed & Broken)
14220	Limestone (Crushed & Broken)	14116	Traprock (Dimension)*
14112	Limestone (Dimension)	14743	Trona
14791	Lithium	10617	Tungsten*
14595	Magnesite	10941	Uranium
10614	Manganese	10940	Uranium-Vanadium Ores
14291	Marble (Crushed & Broken)	10942	Vanadium
14113	Marble (Dimension)	14998	Vermiculite
10920	Mercury	10997	Zircon

\*NOTE: Commodity inactive during the NOHSM survey period. The source for the MSHA SIC CODES are the technical documentation for the MSHA address and employment file.

\*\*NOTE: NIOSH combined the Alumina (Mill) and Aluminum (Ore) commodities into one commodity, Aluminum; the three Clay commodities into one commodity, Clay.

+NOTE: NEC represents Not Elsewhere Classified.

**Table 2**  
**NOHSM MINERAL COMMODITIES AND ASSOCIATED MSHA SIC CODES**

<b>MINERAL COMMODITY</b>	<b>MSHA SIC CODE</b>	<b>MINERAL COMMODITY</b>	<b>MSHA SIC CODE</b>
Aluminum	10510	Mica	14994
Anthracite Coal*	11110	Molybdenum	10615
Aplite	14591	Nonmetallic Minerals, NEC+	14990
Asbestos	14991	Oil Shale	13111
Barite	14720	Perlite	14996
Beryl	10992	Phosphate Rock	14750
Bituminous Coal*	12110	Pigment Minerals*	14792
Boron Minerals	14741	Platinum Group	10993
Cement	32410	Potash	14742
Clay	14530	Pumice	14997
Copper*	10210	Pyrites	14793
Feldspar	14593	Rare Earths	10994
Fluorspar	14730	Salt (Evaporated)	28991
Gemstones	14992	Salt (Rock)	14760
Gilsonite	14993	Sand and Gravel*	14410
Gold*	10410	Sandstone (Crushed & Broken)	14292
Granite (Crushed & Broken)	14230	Sandstone (Dimension)	14114
Granite (Dimension)	14111	Shale (Common)	14596
Gypsum	14920	Silver*	10440
Iron Ore	10110	Slate (Crushed & Broken)	14293
Kyanite	14594	Slate (Dimension)	14115
Lead/Zinc*	10310	Sodium Compounds	14744
Leonardite	29900	Stone, Crushed & Broken, NEC+	14290
Lime	32740	Stone, Dimension, NEC*+	14110
Limestone (Crushed & Broken)	14220	Talc, Soapstone & Pyrophyllite	14960
Limestone (Dimension)	14112	Titanium	10996
Lithium	14791	Traprock (Crushed & Broken)	14294
Magnesite	14595	Trona	14743
Manganese	10614	Uranium	10941
Marble (Crushed & Broken)	14291	Uranium–Vanadium Ores	10940
Marble (Dimension)	14112	Vanadium	10942
Mercury	10920	Vermiculite	14998
Metal Ores, NEC+	10990	Zircon	10997

\*NOTE: Abbreviated or slight change to name: Coal, Anthracite to Anthracite Coal; Coal, Bituminous to Bituminous Coal; Copper Ore to Copper; Gold (Lode and Placer) to Gold; Lead and/or Zinc Ore to Lead/Zinc; Pigment Mineral to Pigment Minerals; Sand & Gravel to Sand and Gravel; Silver Ores to Silver; and Stone, Dimension NEC+ to Stone, Dimension, NEC+.

+NOTE: NEC represents Not Elsewhere Classified.

**Table 3**

**MSHA TAPES USED FOR SELECTION OF NOHSM MINERAL COMMODITIES**

<b>MSHA TAPE</b>	<b>FIRST SEGMENT COMMODITIES</b>	<b>MSHA TAPE</b>	<b>THIRD SEGMENT COMMODITIES</b>
<b>2nd Quarter 83</b>	Aluminum Aplite Asbestos Beryl Boron Minerals Gemstones Gilsonite Gold Gypsum Leonardite Magnesite Mercury Metal Ores, NEC+ Nonmetallic Minerals, NEC+ Perlite Potash Rare Earths Salt (Evaporated) Salt (Rock) Sandstone (Crushed & Broken) Silver Sodium Compounds Trona Vermiculite	<b>1st Quarter 86</b>	Anthracite Coal Feldspar Kyanite Lignite Coal Lime Limestone (Crushed & Broken) Marble (Crushed & Broken) Marble (Dimension) Mica Phosphate Rock Pigment Minerals Pyrites Sandstone (Dimension) Talc, Soapstone & Pyrophyllite Traprock (Crushed & Broken) Zircon
		<b>MSHA TAPE</b>	<b>FOURTH SEGMENT COMMODITIES</b>
<b>MSHA TAPE</b>	<b>SECOND SEGMENT COMMODITIES</b>	<b>2nd Quarter 87</b>	Barite Cement Copper (Porphyry) Copper (Sedimentary) Fluorspar Iron Ore Lead/Zinc (Lead) Lead/Zinc (Zinc) Limestone (Dimension) Lithium Molybdenum Oil Shale Platinum Group Pumice Sand and Gravel Shale (Common) Titanium Uranium Uranium (Solution) Uranium-Vanadium Ores Vanadium
<b>4th Quarter 84</b>	Bituminous Coal Clay Granite (Crushed & Broken) Granite (Dimension) Manganese Slate (Crushed & Broken) Slate (Dimension) Stone, Crushed & Broken, NEC+ Stone, Dimension, NEC+		

+NOTE: NEC represents Not Elsewhere Classified.

### III. SURVEY DESCRIPTION

The field activities for the NOHSM were carried out by ten surveyors who had been trained to conduct the field portion of the surveys. A maximum of six surveyors were in the field at one time. The ten surveyors included six mining engineers, one chemical engineer, one mineral-processing engineer, and two industrial hygienists. Each NOHSM survey consisted of a questionnaire, an inventory, and worksite observations. Mine management had the right to designate any data from all phases of the NOHSM survey as trade secret. Any NOHSM data which is reported to the public must exclude data that was designated as trade secret by mine management.

#### A. Questionnaire

The NOHSM questionnaire, reproduced as Appendix B, was administered at each of the 491 facilities in the NOHSM sample, representing 66 mineral commodities. Several of the questions from the NOHSM questionnaire were taken directly from the NOES questionnaire and some of the questions were modified versions of the NOES questions to make them more appropriate to the mining industry.<sup>2</sup> The questionnaire was designed to document certain management practices and policies toward workers' health. The questions were subdivided into four major subject areas. The first of these subject areas consisted of general facility information which characterized sampled facilities by industrial classification, commodities mined or processed, age, and workforce size. The second and third subject areas contained profile information on the provision of medical and industrial hygiene services to employees as a result of management policy. The final portion of the questionnaire addressed the employee health-related record-keeping practices and the geology of the sampled facility. Appendix C contains the definitions, guidelines, and procedures which the NOHSM surveyor followed for preparing and conducting the questionnaire. These guidelines were not given to mine management.

### B. Inventory

#### 1. Chemical Substance Definition

The NOHSM inventory included all chemical substances and trade name products which were present at the mine site. The NOHSM definition of a chemical substance is any substance that can be unambiguously characterized by a specific chemical name or formula. If a substance was coded as a chemical but was not found on the initial list of accepted chemical terms, a NIOSH chemist (with the assistance of the NOHSM surveyors) determined whether or not the unidentifiable chemical should be coded as a chemical substance or a trade name product. The list of NOHSM accepted chemical terms includes generic substances such as sulfuric acid, hydrogen chloride, sodium hydroxide, acetone, creosote pressure treated wood, waste oil, saw dust, portland cement, copper slag, coal tar pitch volatiles, chalk, creosote ties, and gas mixtures such as (argon-90%, methane-10%).

#### 2. Trade Name Product Definition

If a substance could not be identified by a specific chemical name or formula by the surveyor, it was coded as a trade name product. Trade name products include substances such as Windex Glass Cleaner, WD-40, WD-40 (aerosol), Chevron Sri-Grease No. 2, and Certanium 705 Welding Rod, etc.

#### 3. Product Categories

This inventory was quite diverse; the following product categories are examples: paints; lubricants, oils, and greases; janitorial cleaning chemicals; welding rods and wires; solders; abrasives such as grinding wheels and grinding discs; lab chemicals; mill reagents; sealants and adhesives; explosives; fuels; and aerosol products. The inventory excluded cosmetics, medical supplies, and food items.

#### 4. Associated Data for Each Inventoried Item

For each inventoried item, the NOHSM surveyor recorded the manufacturer or distributor's name and address, the exact product name or chemical name, a product use term (PUT) which described the mining facility's primary use of the inventoried item, an estimated yearly usage rate in pounds or gallons, the location where the product was stored on the mine property, and whether or not the substance was contained in a pressurized aerosol can. The designation of being contained in an aerosol can was coded because aerosol canned substances usually involve a propellant gas, a solvent or thinner vapor, and a mist. The names of the PUTs, which are listed in Appendix D, were taken directly from the NOES with some additions, deletions, and modifications to make the list more appropriate to the mining industry.<sup>2</sup>

### C. Worksite Observations

#### 1. Potential Exposure Definition

During the worksite visit, the surveyors observed and interviewed workers to determine their potential exposures at the worksite. The term "potential exposure" had two criteria. First, the NOHSM surveyor must have determined that the health-related agent was in sufficient proximity to a worker such that the agent could have entered or contacted the body of the worker, although the level of exposure was not measured by NIOSH. Second, the duration of the potential exposure must have met the minimum duration guidelines (i.e., a part-time duration was defined as the potential exposure time which was greater than 30 minutes per week [on an annual average] or at least once per week, 90 percent of the weeks of the work year).

#### 2. Categories of Potential Exposures

##### a. Physical agent potential exposures

The definitions, guidelines, and procedures for coding physical agent potential

exposures are listed in Appendix E. The physical agents that were recorded during the worksite observations were:

(1) Noise

(2) Heat (whether caused by work processes or generated by underground rock strata).

(3) Radiation (ionizing radiation from ore bodies were recorded as potential exposures when the surveyor was notified of such conditions, but the environmental levels were not assessed).

(4) Vibration (whole-body or segmental).

##### b. Musculoskeletal overload potential exposures

The musculoskeletal overload potential exposures consisted of twelve different types of awkward bending, posture, and lifting. The definitions, guidelines, and procedures for coding musculoskeletal overload potential exposures are listed in Appendix F.

##### c. Welding, brazing, and soldering potential exposures

The elements coded in welding, brazing, or soldering operations, which are listed in Appendix G, were taken from the NOES.<sup>2</sup>

##### d. Abrasive grinding potential exposures

The three elements coded in abrasive grinding operations were the names of the metals being ground, the trade names of the grinding wheels or discs used, and any chemical substances or trade name products attached to the metals that were ground; such as solvents used to clean the metals or lubricants used to lubricate metals prior to grinding.

##### e. Chemical substance potential exposures

Only the chemical substances recorded during the inventory phase of the

NOHSM survey and observed during the worksite observations to meet potential exposure guidelines were recorded as chemical substance potential exposures.

*f. Trade name product potential exposures*

Only the trade name products recorded during the inventory phase of the NOHSM survey and observed during the worksite observations to meet potential exposure guidelines were recorded as trade name product potential exposures.

*g. Bulk dust potential exposures*

At each worksite, approximately 10 cubic centimeters of fine settled dust were collected in a plastic vial. If no fine settled dust was available, coarser bulk dust was collected. Of all the bulk dust samples gathered at each mine, five were selected and analyzed for crystalline silica (quartz, cristobalite, and tridymite), 31 different elements, and asbestos. When fewer than five bulk dust samples were collected, all were submitted for analysis.

**3. Potential Exposure Exclusions**

Any potential exposures which occurred as a result of non-work activities were not coded. Thus the surveyor did not code the potential exposures which resulted from the personal use of alcohol; tobacco; prescribed, over-the-counter, or recreational drugs; or perfume.

**4. Associated Data for Each Potential Exposure**

For each potential exposure, the surveyor coded the following information: occupation, operation, location, number of workers involved (by sex), the duration, the controls intended to reduce the effects of that potential exposure, how the product was used at that particular worksite (PUT), and if the product was being combusted (such as diesel fuel or gasoline that is combusted

as fuel in engines). The names and definitions of the occupations, operations, and locations were taken directly from an MSHA list of occupations, operations, and locations for metal and non-metal mines (Appendix H) and coal mines (Appendix I). The duration was defined as the approximate length of time that an employee group or occupation was potentially exposed to any of the recordable potential exposures which were previously defined in this report. The potential exposure duration could have been either full- or part-time. A full-time duration was defined as the potential exposure time which was greater than four hours per day and on a daily basis of at least 90 percent of the company's work year or a standard work year. A part-time duration was defined as the potential exposure time which was greater than 30 minutes per week [on an annual average] and not full time, or at least once per week, 90 percent of the weeks of the work year. Surveyors entered worksite PUTs and inventory PUTs. The worksite PUT described how the product was used at that particular worksite where the potential exposure occurred; the inventory PUT described the entire mine's major use of the product. Both the worksite PUTs and the inventory PUTs are also listed in Appendix D. The intended controls were defined as the measures which were intended by management to protect the employees at risk to the potential exposures listed previously. These controls included ventilation, personal protective equipment, administrative measures, and others. The names and definitions of the intended controls for NOHSM, listed in Appendix J, were taken directly from the NOES.<sup>2</sup>

**IV. DATA PROJECTION AND VARIANCE CALCULATION FORMULAS**

**A. Introduction**

NOHSM was designed to provide the capability to project the survey data to national statistics and calculate variances for the projections. One major advantage of the NOHSM design is

the simplicity of the projection and variance calculation formulas. After listing the required notation below, the general formula is shown for the projection of a characteristic of the target population. This is followed by the formulas to be used for calculating the variance of the projections.

## B. Notation

Let:

- L denote the number of commodities
- h denote the hth commodity
- i denote the ith unit (mine) within commodity h
- j equal to 1, denote a self-representing unit (SRU)
- j equal to 2, denote a non-self-representing unit (NSRU)
- $N_{h1}$  denote the number of self-representing units in commodity h in the population
- $n_{h1}$  denote the number of self-representing units in commodity h in the sample (by definition of self-representing  $n_{h1} = N_{h1}$ )
- $N_{h2}$  denote the number of non-self-representing units in commodity h in the population
- $n_{h2}$  denote the number of non-self-representing units in commodity h in the sample
- $\pi_{hi1}$  denote the probability of the ith self-representing unit in commodity h being included in the sample (by definition of self-representing  $\pi_{hi1} = 1$  for all (h, i, 1))
- $\pi_{hi2}$  denote the probability of the ith non-self-representing unit in commodity h being included in the sample
- $M_{hi1}$  denote the number of employees in the ith self-representing unit within commodity h in the population

$M_{hi2}$  denote the number of employees in the ith non-self-representing unit within commodity h in the population

$M_{h1}$  denote the total number of employees in the self-representing units in commodity h in the population

$M_{h2}$  denote the total number of employees in the non-self-representing units in commodity h in the population

$Y_{hij}$  denote the value of the characteristic "Y" for (h, i, j)

$\hat{Y}_{h1}$  denote the projection of the population total for the self-representing units within commodity h for characteristic "Y" ( $\hat{Y}_{h1}$  will equal the actual  $Y_{h1}$  since the units are self-representing)

$\hat{Y}_{h2}$  denote the projection of the population total for the non-self-representing units within commodity h for characteristic "Y"

$\hat{Y}_h$  denote the projection of the population total for commodity h for characteristic "Y" ( $\hat{Y}_h = \hat{Y}_{h1} + \hat{Y}_{h2}$ )

$\hat{Y}$  denote the projection of the population total of characteristic "Y"

$V\hat{a}r(\hat{Y}_{h2})$  denote the estimated variance of  $\hat{Y}_{h2}$

$V\hat{a}r(\hat{Y}_h)$  denote the estimated variance of  $\hat{Y}_h$

$V\hat{a}r(\hat{Y})$  denote the estimated variance of  $\hat{Y}$

## C. Projection Techniques

$$\hat{Y} = \sum_{h=1}^L \hat{Y}_h$$

$$\hat{Y}_h = \sum_i ( \hat{Y}_{h1} + \hat{Y}_{h2} )$$

$$\hat{Y} = \sum_h \sum_i \frac{Y_{hi1}}{\pi_{hi1}} + \sum_h \sum_i \frac{Y_{hi2}}{\pi_{hi2}}$$

Equation (1)

where:

$$\pi_{hi1} = 1 \text{ for all } (h, i, 1)$$

$$\pi_{hi2} = n_{h2} \frac{M_{hi2}}{\sum_i M_{hi2}}$$

$$\pi_{hi2} = n_{h2} \frac{M_{hi2}}{M_{h2}}$$

Substituting:

$$Z_{hi2} = \frac{M_{hi2}}{M_{h2}},$$

$\pi_{hi2}$  can be written as  $\pi_{hi2} = n_{h2} Z_{hi2}$

#### D. Variance Calculations

The actual variance of  $\hat{Y}_h$ , denoted by  $\text{Var}(\hat{Y}_h)$ , is given by the expression

$$\text{Var}(\hat{Y}_h) = \text{Var}\left(\sum_{i=1}^{n_{h2}} \frac{Y_{hi2}}{n_{h2} Z_{hi2}}\right)$$

The variance of  $\hat{Y}_h$  can be estimated by the expression

$$\hat{\text{Var}}(\hat{Y}_h) = \hat{\text{Var}}\left(\sum_{i=1}^{n_{h2}} \frac{Y_{hi2}}{\pi_{hi2}}\right)$$

This expression is independent of the self-representing units, since these units contribute nothing to the variance of  $\hat{Y}_h$ . Upon substituting  $\pi_{hi2} = n_{h2} Z_{hi2}$ , this expression can be estimated by the equation

$$\hat{\text{Var}}(\hat{Y}_h) = \hat{\text{Var}}\left(\sum_{i=1}^{n_{h2}} \frac{Y_{hi2}}{n_{h2} Z_{hi2}}\right)$$

$$\hat{\text{Var}}(\hat{Y}_h) = \frac{\sum_{i=1}^{n_{h2}} \left(\frac{Y_{hi2}}{Z_{hi2}} - \hat{Y}_{h2}\right)^2}{n_{h2} (n_{h2} - 1)}$$

Equation (2)

where:

$$\hat{Y}_{h2} = \sum_{i=1}^{n_{h2}} \frac{Y_{hi2}}{\pi_{hi2}} = \sum_{i=1}^{n_{h2}} \frac{Y_{hi2}}{n_{h2} Z_{hi2}}$$

The variance of  $\hat{Y}$  can be estimated by the expression

$$\hat{\text{Var}}(\hat{Y}) = \sum_h \hat{\text{Var}}(\hat{Y}_h) \quad \text{Equation (3)}$$

where  $\hat{\text{Var}}(\hat{Y}_h)$  is obtained from the equation (2).

The standard deviation of  $\hat{Y}$  can be estimated by the expression

$$\text{Std Dev}(\hat{Y}) = [\hat{\text{Var}}(\hat{Y})]^{1/2} \quad \text{Equation (4)}$$

where  $\hat{\text{Var}}(\hat{Y})$  can be obtained from Equation (3).

If no response was obtained from some mines in the sample (i.e., the mines were closed), the summations in equations (1) and (2) are understood to include only mines from which survey data were obtained.

The variance estimators for  $\hat{Y}_h$  and  $\hat{Y}$  using equations (2) and (3) are based on the assumption that the units were sampled with replacement through the procedure of random selection with probability proportional to size. In the design, the units were sampled with replacement using the procedure of systematic selection with probability proportional to size. Because units in each commodity are listed in order of mine ID (which gives an implicit stratification by state and age) the units adjacent in the list will tend to be similar. The variances using systematic sampling with probability proportional to size are smaller than random sampling with probability proportional to size. Consequently, these variance equations

give conservative estimates of the variance; that is, the actual variance will be no larger than the random sampling variance.

The standard deviations for  $\hat{Y}$  which are obtained by using equation (4) can provide a rough indicator of the variance about the projection. Many of these standard deviations are quite large, such as the standard deviations for the projections of most of the chemicals listed in Appendix O. It is beyond the scope of this report to provide the projections and standard deviations for all of the data gathered by NOHSM. However, any parties that are interested in the projections and standard deviations for specific agents of interest should direct their requests to the NOHSM project officer listed in the discussion, Section IX of this report, or obtain the NOHSM database that is described in the NOHSM database, Section VI of this report and perform the calculations themselves. A document entitled "*Final Report on the Sampling Design for the Occupational Health Survey of the Mining Industry*" provides a thorough description of the NOHSM data projection and variance calculation equations.<sup>4</sup>

## V. NOHSM Commodity Reports

Once the NOHSM data were coded and computerized, commodity reports were generated. The commodity reports identify potential exposures for entire commodities and provide the associated numbers of workers, the occupations of those workers, and the locations on the mine property where the potential exposures were observed. This information is categorized into seven tables: four concerning chemical agents; one concerning musculoskeletal overload conditions; one concerning physical agent conditions; and one concerning welding processes. Estimated annual usage (pounds and gallons) is provided for chemical agents and trade name products. Commodity reports have been provided to MSHA and other interested parties. Appendix K contains the Stone, Dimension, NEC commodity report, which provides an example of the commodity reports produced for NOHSM.

## VI. NOHSM Database

### A. Processing of Datasets

After the field data were collected and coded, the data were keyed into a facility dataset. This dataset was processed by using the PL/I multi-purpose programming language to perform edit checks on the data.<sup>5</sup> After the dataset passed all the edits, it was placed into the NOHSM master file. The master file was then processed by using PL/I and Statistical Analysis System (SAS) programs to create SAS datasets.<sup>6</sup> These datasets include SAS and other types of datasets.

### B. Types of SAS Datasets Created

A SAS data file consists of a collection of data values arranged in rectangular form by the SAS software.

1. Inventory dataset: Contains a complete inventory of all the chemicals and trade name products used or stored on the mine property, along with management's estimate of the mining facility's annual consumption and primary use for each item that was recorded. See Section III. B, *Inventory*, for further detail about the data that was gathered during the inventory.
2. Worksite dataset: Contains the potential exposure data that was gathered from each employee group or unique occupation, along with the associated data for each potential exposure. See Section III. C, *Worksite Observations*, for further detail about the data gathered during the worksite observations.
3. Trade name product usage dataset: Contains the trade name product annual usage projections by commodity.
4. Chemical usage dataset: Contains the chemical annual usage projections by commodity.

5. Commodity occupation dataset: Contains the projected number of workers associated with each occupation by commodity.
6. Commodity location dataset: Contains the projected number of workers associated with each location by commodity.
7. Facility occupation dataset: Contains the projected number of workers associated with each occupation by mining facility.
8. Facility location dataset: Contains the projected number of workers associated with each location by mining facility.

### C. Other Types of Datasets Created

In addition to the above listed SAS data sets, other data sets were created using various methods. These include:

1. Questionnaire dataset: Contains the responses for most of the 51 questions in the questionnaire answered by a knowledgeable representative of mine management. This is a sequential file (a set of records in consecutive order).
2. Commodity dataset: Contains the information required to associate any NOHSM data with the appropriate commodity, the statistical value used to calculate that commodity's projections, and the projected number of workers for that commodity. This is a SAS data file.
3. Facility dataset: Contains the information required to associate any NOHSM data with the appropriate commodity, the statistical value used to calculate that commodity's projections, and the number of workers for that facility. This is a SAS data file.
4. Chemical dataset: Contains the translation of the chemical hazard codes in the inventory and worksite datasets. This is a sequential data file.
5. PUT dataset: Contains the translation of the product use terms in the inventory and worksite datasets. This is a sequential data file.
6. Trade name product dataset: Contains the translation of the trade name product codes in the inventory and worksite datasets. This is a SAS data file.
7. Manufacturer dataset: Contains the translation of the manufacturer/distributor codes in the inventory and worksite datasets. This is a SAS data file.
8. Metal/non-metal occupation dataset: Contains the translation of the metal/non-metal occupation codes in the worksite dataset. This is a sequential file.
9. Metal/non-metal location dataset: Contains the translation of the metal/non-metal location codes in the worksite dataset. This is a sequential file.
10. Metal/non-metal operation dataset: Contains the translation of the metal/non-metal operation codes in the worksite dataset. This is a sequential file.
11. Coal occupation dataset: Contains the translation of the coal occupation codes in the worksite dataset. This is a sequential file.
12. Coal location dataset: Contains the translation of the coal location codes in the worksite dataset. This is a sequential file.
13. Coal operation dataset: Contains the translation of the coal operation codes in the worksite dataset. This is a sequential file.
14. MSHA chemicals dataset: Contains the chemicals regulated by MSHA. This is a sequential file.
15. NIOSH chemicals dataset: Contains the chemicals that have a NIOSH recommended exposure limit. This is a sequential file.

By using these datasets, the commodity reports were generated. All but the data entry was

accomplished on an IBM 4361 mainframe. The data entry was accomplished on personal computers.

## D. PC-based NOHSM Query System

### 1. Basic Options to Form a Query

In June, 1991, the PC-based NOHSM query system was completed. This system allows queries to be processed against the data collected during the NOHSM survey, after the data has been loaded into a PC. The NOHSM query system was developed to be user friendly so that end-users could process their own queries against the NOHSM data. This was accomplished by making the system key-driven with on-line help and simplifying the query formulation process by minimizing the selections. There are two basic steps in formulating a query. Step one is deciding which data the user wishes to retrieve or how the user wishes to retrieve the data (*SELECTION CRITERIA*) and step two is deciding what the user wishes to see once the query is processed (*OUTPUT VARIABLES*). Table 4 shows the NOHSM query system menu options including all of the data elements that can be accessed.

### 2. Availability of PC-Based Query System

This system was designed using the CA-Clipper software, which creates a stand-alone executable program.<sup>7</sup> This allows end-users to utilize the NOHSM query system without requiring them to purchase or possess the Clipper software. This database is currently available to any interested parties. It requires 300 mega-bytes of hard disk storage capacity to install it on a computer. This database is currently distributed on 30 floppy diskettes. NIOSH has developed a CD-ROM disc with the NOHSM query system included as an alternative for those end-users who do not wish to place the NOHSM query system on a personal computer. Any parties that are interested in special queries from the NOHSM data or a copy of the PC-based

NOHSM query system should direct their requests to:

Project Officer

National Occupational Health Survey of Mining  
National Institute for

Occupational Safety and Health (NIOSH)  
Division of Respiratory Disease Studies (DRDS)  
Environmental Investigations Branch  
Environmental Surveillance Team  
1095 Willowdale Road  
Morgantown, WV 26505-2888

### 3. Query Example

An example of a possible query and the steps taken to create the query and its results are shown below.

Query: What physical agents are mechanics potentially exposed to in the Uranium - Vanadium Ore commodity? Also list the other occupations and the projected number of workers potentially exposed to each physical agent.

Step 1: To select the "*selection criteria*": Place the highlighted bar in the "*SELECTION CRITERIA*" column by using the left or right arrow.

Step 2: To select the commodity: Place the highlighted bar on the "*Independent Commodities*" option under the "*SELECTION CRITERIA*" column and press the <ENTER> key. Then place the highlighted bar on the "*Uranium-Vanadium Ore*" option and press the <ENTER> key. Press the <END> key.

Step 3: To select the "*mechanics*" occupation: Place the highlighted bar on the "*Job Titles*" option under the "*SELECTION CRITERIA*" column and press the <ENTER> key. To locate the job title that starts with "*MECH*": Press the <INS> key and enter "*MECH*" (no quotes) in the highlighted space at the bottom of the screen and press the <ENTER> key. The highlighted bar is now on the title "*MECHANIC*";

press the <ENTER> key and then press the <END> key.

Step 4: To select the "output variables": Place the highlighted bar in the "OUTPUT VARIABLES" column by using the left or right arrow.

Step 5: Place the highlighted bar on each of these options and press the <ENTER> key: "Commodities," "Physical Agents," "Job Titles," and "Number of Workers (Summary)."

Step 6: Press the <F7> key to produce the report. Table 5 shows the results of this query.

**Table 4**

**NOHSM QUERY SYSTEM OPTIONS AND DATA ELEMENTS**

<b>SELECTION CRITERIA</b>	<b>OUTPUT VARIABLES</b>
Independent Commodities	Commodities
Combined Commodities	Chemicals
Chemicals	Trade Names
Trade Names	Manufacturers
Manufacturers	Product Use Terms
Chemicals/Trade Names	Physical Agents
Product Use Terms	Musculoskeletal Overloads
Physical Agents	Welding Processes
Musculoskeletal Overloads	Welding Metals
Welding Processes	Grinding Metals
Welding Metals	Job Titles
Grinding Metals	Locations
Independent Controls	Operations
Combined Controls	Controls
Job Titles	Questions
Locations	Bulk Dust Types
Operations	Number of Workers (Summary)
Questions	Number of Workers (Detail)
Projected Annual Usages	Projected Annual Usage (Summary)
Number of Workers	Projected Annual Usage (Detail)
Bulk Dust Types	Bulk Dust Percent (Summary)
Bulk Dust Percentages	Bulk Dust Percent (Detail)
Welding Chemicals	Number of Workers (All workers)
Welding Trade Names	Number of Workers (Males)
Grinding Chemicals	Number of Workers (Females)
Grinding Trade Names	Count of Chemicals
	Count of Trade Names
	Count of Product Use Terms
	Count of Physical Agents
	Count of Musculo. Overloads
	Count of Welding Processes
	Count of Grinding Metals
	Welding Process Chemicals
	Welding Process Trade Names
	Grinding Chemicals
	Grinding Trade Names
	Employment Level Summary

**Table 5**  
**RESULTS OF NOHSM QUERY EXAMPLE**

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**SELECTION CRITERIA/OUTPUT VARIABLES**

**Independent Commodities:**

URANIUM-VANADIUM ORES

**Job Titles:**

MECHANIC (M/NM 604)

**OUTPUT VARIABLES:**

Commodities

Physical Agents

Job Titles

Number of Workers (Summary)

=====

<b>Commodity:</b>	URANIUM-VANADIUM ORES	
<b>Phy. Agent:</b>	IONIZING RADIATION	
<b># of Observed:</b>	42 (All Workers)	
<b># of Projected:</b>	42 (All Workers)	
<b>% of Workers:</b>	93 (All Workers)	
<b>Job Titles:</b>	9% ADMIN, SUPERVISORY, MGT PERSONNEL	(M/NM 659)
	40% COMPLETE LOAD / HAUL / DUMP CYCLE	(M/NM 728)
	4% LABORATORY TECHNICIAN	(M/NM 514)
	18% LEACHING OPERATIONS WORKER	(M/NM 673)
	13% MECHANIC	(M/NM 604)
	7% SLURRY, MIXING OR PUMPING WORKERS	(M/NM 579)
	2% TRUCK DRIVER	(M/NM 376)

-----

<b>Commodity:</b>	URANIUM-VANADIUM ORES	
<b>Phy. Agent:</b>	NOISE	
<b># of Observed:</b>	24 (All Workers)	
<b># of Projected:</b>	24 (All Workers)	
<b>% of Workers:</b>	53 (All Workers)	
<b>Job Titles:</b>	40% COMPLETE LOAD / HAUL / DUMP CYCLE	(M/NM 728)
	13% MECHANIC	(M/NM 604)

-----

<b>Commodity:</b>	URANIUM-VANADIUM ORES	
<b>Phy. Agent:</b>	SEGMENTAL BODY VIBRATION	
<b># of Observed:</b>	4 (All Workers)	
<b># of Projected:</b>	4 (All Workers)	
<b>% of Workers:</b>	9 (All Workers)	
<b>Job Titles:</b>	9% MECHANIC	(M/NM 604)

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**Message:** END OF REPORT

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## VII. LIMITATIONS OF THE NOHSM DATA

The following limitations of the NOHSM data must be recognized:

### A. Annual Usage Data

The annual usage data for each inventoried item were only a guide to the projected magnitude of usage for those items. The annual usage data were the total amount of gallons or pounds of each inventoried item which the mine used in the 12 months immediately preceding a survey; and were based on estimates which were provided by mine management. It is possible that an item might have been represented as having an annual usage rate of zero with workers observed to be potentially exposed to that item. This might have occurred since annual usage rates were generally based on purchases during the 12 months immediately preceding a survey. Therefore, items purchased prior to that 12 month period might have been represented as having a zero annual usage rate even though potential exposures were observed during the survey. Other items with zero usage rates which could have been observed as potential exposures could have been recyclable items such as catalysts and desiccants, items such as paints and coatings applied prior to the 12 month period but present in the workplace in such a way as to present a potential exposure, and obsolete items no longer actively used on the mine property but to which employees could have still been potentially exposed in the course of their work. Furthermore, all the estimates from mine management were rounded to the nearest whole number, with all quantities between 0 and 1 being reported as 1. Thus, extremely small usage rates may actually be lower than estimated. With this possible exception, NIOSH believes the projected magnitude of the usage rate to be appropriately represented.

### B. Large Variances in Projections

The projections of attributes that have previously been described have variances and standard deviations which are dependent on the observed data from NSRUs, however these

variances and standard deviations are not accounted for in the projections. Many of these standard deviations are quite large, such as the standard deviations for the projections of most of the chemicals listed in Appendix O.

### C. Trade Secret Data Exclusions

Mine management had the right to designate any data from all phases of the NOHSM survey as trade secret. Any NOHSM data which is reported to the public must exclude data that was designated as trade secret by mine management. Seventy-nine of the four hundred ninety-one mines (16 percent) surveyed under NOHSM designated some data from at least one phase of the NOHSM as trade secret.

### D. Time Dependency of Data

Since the NOHSM surveys were conducted at one point in time, the data will become outdated due to subsequent changes occurring at surveyed mine sites or in the mining industry as a whole. The data in the NOHSM database may be slightly changed in the future to make the information more applicable to that point in time. For example, the number of employees in each mine at the time the NOHSM sample was selected was used to calculate the commodity projections and variances, but the current number of employees in these mines could be substituted to calculate the commodity projections and variances.

### E. Lack of Trade Name Product Resolution

NOHSM has not determined the chemical ingredients for trade name products. When questioning the NOHSM query system for the presence of a chemical, only the single chemical data will appear in the results. Because of the lack of trade name product chemical ingredients, the trade name products cannot be queried for the presence of a chemical.

### F. Bulk Dust

For each worker that was observed and interviewed during the worksite visit, approximately 10 cubic centimeters of fine settled dust were collected in a plastic vial. Coarse bulk

dust was collected if no fine settled dust was available. The limitation of bulk dust samples as an indicator of airborne dust must be recognized: bulk dust samples can only be used to estimate the percentage of crystalline silica, trace elements, or asbestos in the worksite dust; but not the concentration of airborne quartz, trace elements, or asbestos. Bulk dust samples may represent an accumulation of dust over many months or dust which was recently deposited. It is possible that a bulk dust sample may have never been airborne. The bulk dust results are reflective of the 491 mines surveyed under NOHSM and should not be projected to other mine sites in the same way that other agents are projected.

## VIII. RESULTS

### A. Questionnaire

Appendix L contains results for most questions from the questionnaire. Since results for all of the 66 mineral commodities surveyed under NOHSM cannot be conveniently displayed in Appendix L in this report, the 66 mineral commodities have been grouped under the 6 mineral industries which MSHA uses in their annual injury experience information reports: stone mining, nonmetallic mineral mining, sand and gravel mining, anthracite coal mining, bituminous coal mining, and metallic mineral mining.

### B. Inventory

The inventory contains 84,939 trade name products and 2,570 chemical substances. Approximately 31 percent of all inventoried items were recorded as having zero usage (not having been used in the 12 months before the mine was surveyed as estimated by mine management). Two hundred fifty-seven (257) MSHA-regulated chemicals were found during the surveys, in addition to approximately 2,197 chemicals that have no NIOSH recommended exposure limit (REL) or MSHA permissible exposure limit (PEL). For each inventoried item, the NOHSM surveyor recorded mine management's estimated annual usage rate in gallons or pounds. Appendices M and N

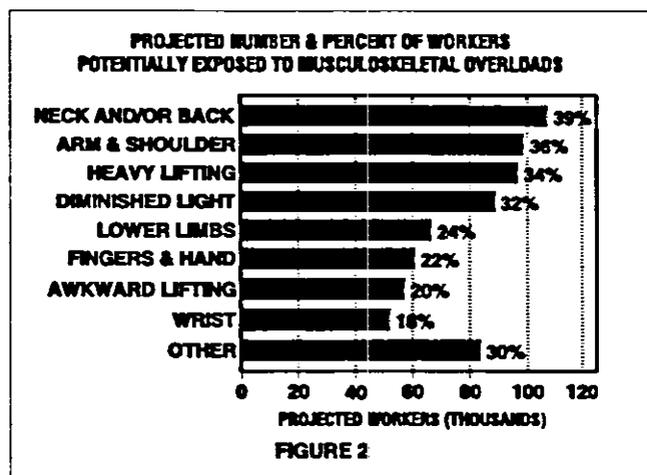
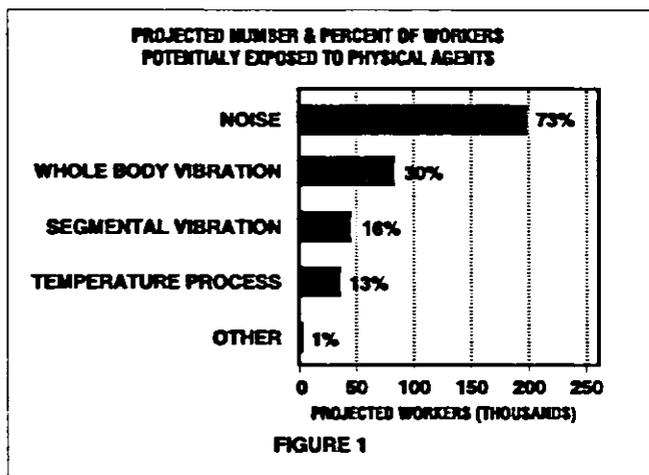
list the 100 chemical substances which had the highest annual usage rate (amount used in the previous 12 months before the NOHSM survey was conducted at the mine) in gallons and pounds. The data in Appendices M and N are mutually exclusive, with some exceptions which are noted with asterisks (\*). Any chemical substances that occur in both Appendices M and N have total use projections in both gallons and pounds. For example, sulfuric acid has a total projected usage rate of 4,888,000 gallons and 220,659,158 pounds; these numbers were not double-counted. Seven of the ten chemicals with the highest usage rate (by gallons) are fuels: natural gas, methane, acetylene, diesel fuel no. 2, gasoline-unleaded, diesel fuel no. 1, and gasoline-leaded.

### C. Worksite Observations

All of the potential exposure results from the worksite observation phase of the NOHSM survey include both full- and part-time potential exposures which were previously defined in the survey description section of this report.

#### 1. Physical Agent Potential Exposures

The health effects of noise, whole-body and segmental vibration, heat stress, and ionizing radiation in the mining industry have been presented in a number of publications.<sup>8, 9, 10, 11, 12, 13, 14, 15, 16</sup> Figure 1 indicates the projected number, and percent, of workers who were potentially exposed to the different types of physical agents recorded under NOHSM. These recorded physical agent potential exposures did not necessarily exceed NIOSH's recommended exposure limits (RELs) or any MSHA or OSHA standards for physical agents. For example, the NOHSM surveyor coded a potential exposure to noise (NL) whenever the surveyor had to raise his/her voice above a normal conversational level to be heard by the person standing next to him/her. The written definitions, guidelines, and procedures to code physical agents which NIOSH established for NOHSM are listed in Appendix E. "Other" in Figure 1 includes temperature (underground strata)



and ionizing, ultraviolet, microwave, laser, and miscellaneous radiation.

## 2. Musculoskeletal Overload Potential Exposures

The health effects of musculoskeletal overloads in the mining industry have been presented in several recent publications.<sup>17, 18, 19</sup> Figure 2 shows the projected number, and percent, of workers potentially exposed to the different types of musculoskeletal overloads. These recorded musculoskeletal overload potential exposures did not necessarily exceed any NIOSH, MSHA, or OSHA guidelines for musculoskeletal overloads. For example, the NOHSM definition for the heavy lifting musculoskeletal overload was lifting greater than 50 pounds, unaided. The definitions, guidelines, and procedures for coding potential exposures to musculoskeletal overloads which NIOSH established for NOHSM are listed in Appendix F. "Other" in Figure 2 includes sitting, frequent lifting, prone or supine lying, and standing. Although diminished light is not a musculoskeletal overload, it was included in the NOHSM survey because it could make work more fatiguing and hazardous.

## 3. Welding, Brazing, and Soldering Potential Exposures

The health effects of welding, brazing, and soldering processes have been presented in several recent publications.<sup>20, 21, 22, 23, 24, 25, 26</sup> NIOSH surveyors identified and coded 24 of the 34 different types of welding, brazing, and soldering processes that are shown in Appendix G. These processes included: 18 types of welding, 3 types of cutting, 1 type of brazing, and 2 types of soldering. Approximately 32 percent of the projected number of workers were potentially exposed to welding or cutting processes. Less than 3 percent of the projected number of workers were potentially exposed to brazing and soldering processes. The most common types of welding and cutting processes were shield metal arc welding (with 20 percent of all projected number of workers potentially exposed) and oxy-fuel gas cutting (with 25 percent of all projected number of workers potentially exposed).

## 4. Chemical Substance and Trade Name Product Potential Exposures

The Bureau of Mines has found that chemicals in mining are an occupational health concern.<sup>27</sup> In addition, NIOSH's Health Hazard Evaluation Team has conducted approximately 40 investigations which involved occupational health concerns regarding various chemicals in the mining

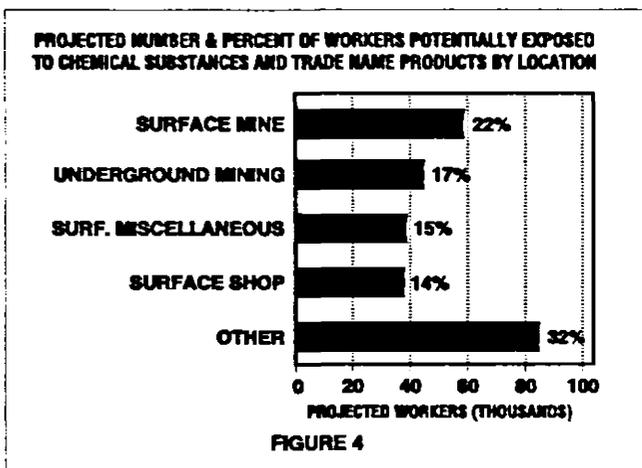
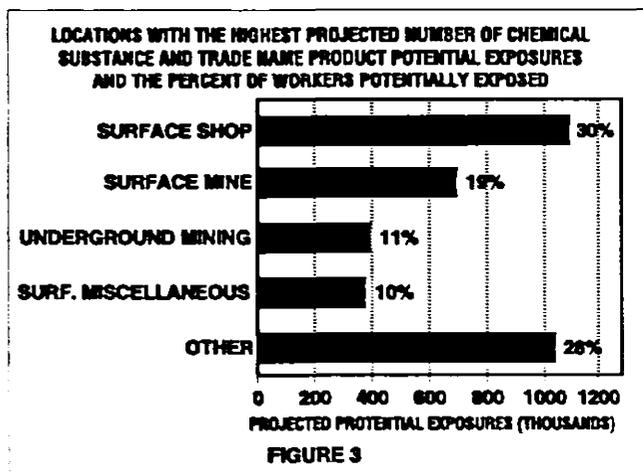
industry. Several of the chemicals and trade name products used in a mining facility can become airborne throughout an entire facility or over large areas of a facility which can cause a large number of workers to become potentially exposed to them. Some of these products include: rock dust, welding rods, and paints.

a. *Locations with the highest projected number of chemical substance and trade name product potential exposures*

Figure 3 shows the four locations associated with the highest projected number of chemical substance and trade name product potential exposures along with the percent of workers who were potentially exposed to those substances. The names of the locations were taken from the MSHA location codes listed in Appendices H and I. The "surface shop" location yielded the highest projected number of chemical substance and trade name product potential exposures (1,104,250). "Other" in Figure 3 includes underground shop, coal preparation plant, underground warehouse, underground miscellaneous, surface warehouse, surface laboratory, surface bathhouse, underground mill, surface crushing, surface grinding, surface flotation and reagents, and surface mill.

b. *Projected number of workers potentially exposed to chemical substances and trade name products by location*

Figure 4 shows the projected number, and percent, of workers who were potentially exposed to chemical substances and trade name products in each location listed in Figure 3. Any worker could have been potentially exposed to one or more chemical substances or trade name products, which explains why the projected number of chemical substance and trade name product potential exposures from Figure 3 was greater than the projected number of workers that were potentially exposed to these chemical



substance and trade name products in the locations in Figure 4.

c. *Chemical substance potential exposures*

Appendix O lists the 100 chemical substances with the highest projected number of workers potentially exposed. The number of workers potentially exposed to chemical substances contained in the ore being mined is not reported in Appendix O. Appendix O only reports those chemical substances which were purchased and then used in the mining process. Hence, in Appendix O, coal miners are not listed as being potentially exposed to coal, asbestos miners are not reported as being potentially exposed to

asbestos, and so forth. These potential exposures are listed in Appendix P. The eight chemical substances to which workers were most frequently potentially exposed were all fuels: diesel fuel no. 2, acetylene, unleaded gasoline, leaded gasoline, diesel fuel no. 1, propane, coal, and kerosene.

d. *Trade name product potential exposures*

Appendix Q lists the 100 trade name products with the highest projected number of workers potentially exposed. The chemical ingredients for trade name products have not been determined.

5. Product Use Term (PUT) Potential Exposures

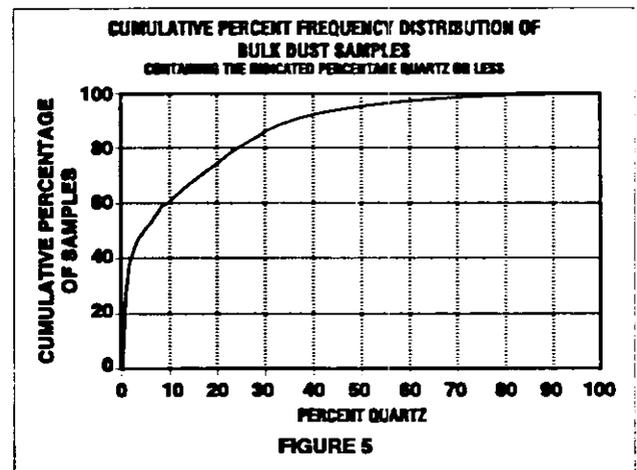
For each potential exposure, the NOHSM surveyor recorded a PUT which indicated how the product was used at that particular worksite. Appendix R lists the 100 PUTs with the highest number of projected workers potentially exposed. The ten PUTs most frequently associated with potential exposures were maintenance-related products: fuel, grease, hand cleaner, hydraulic oil, motor oil, not elsewhere classified oil, gear oil, welding rod, solvent, and penetrant.

6. Bulk Dust Potential Exposures

Out of 7,143 bulk dust samples collected from the NOHSM, 2,075 were analyzed for crystalline silica (quartz, cristobalite, and tridymite), 2,151 for 31 different elements, and 2,152 for asbestos. The bulk dust results are reflective of the 491 mines surveyed under NOHSM and should not be projected to other mine sites in the same way that other agents are projected. NIOSH and other interested parties have access to MSHA's airborne dust compliance data through a number of publications.<sup>28, 29 30</sup> The NOHSM bulk dust data could be used in conjunction with the MSHA airborne dust compliance data for future research efforts.

a. *Quartz*

The NIOSH analytical method #7500 was used to determine the percentage of quartz in the bulk dust samples.<sup>31</sup> This method uses x-ray powder diffraction as a measuring technique. Figure 5 shows the cumulative frequency distribution of the percent quartz contained in bulk dust samples. Nearly 30 percent of the 2,075 analyzed samples were equal to or less than 1 percent quartz. Approximately 50 percent of all samples had a quartz percentage of 5 or greater. Approximately 38 percent of the samples contained greater than 10 percent quartz. If one assumes that the one to five bulk dust samples analyzed for each mine represents the percent quartz for the entire mine and that the average of all analyzed samples for a given commodity is representative of that commodity then, approximately 214,000 miners were potentially exposed to bulk dust which had an average quartz percentage greater than 5. MSHA begins to reduce exposure standards based on quartz content of greater than 5 percent.<sup>32</sup> While this is not a "projection" in the context described in Section IV, it is an index of how widespread potential exposures to quartz may be in the mining industry.



b. *Elements*

The NIOSH analytical method #7300 was used for the trace element analysis of the NOHSM bulk dust samples.<sup>31</sup> This method uses inductively coupled argon plasma-atomic emission spectroscopy (ICP-AES) as a measuring technique. Table 6 shows the median, maximum, and the mean percentage of the 31 different elements analyzed from 2,151 NOHSM bulk dust samples. The average element content ranged from 0.01 percent to 5.25 percent. Calcium (5.25 percent), Iron (4.34 percent), Aluminum (2.52 percent), Sodium (1.59 percent) and Magnesium (1.11 percent) had the

highest mean percentage of element content out of the 31 different elements analyzed from the NOHSM bulk dust samples. Although Table 6 shows that the average percentage of arsenic was only 0.01 percent from the 2,151 NOHSM bulk dust samples which represented all of the 491 mines surveyed under NOHSM, Table 7 shows that the bulk dust samples collected from the Rare Earths and Zircon commodity mines yielded averages of 0.93 percent and 0.17 percent of arsenic in their respective bulk dust samples. Although it may appear that these commodities were under-represented since only one facility was surveyed for each of these com-

**Table 6**  
**BULK DUST ELEMENTS RESULTS**

<b>ELEMENT</b>	<b>MEDIAN</b>	<b>MAXIMUM</b>	<b>MEAN</b>
Aluminum	1.72%	33.30%	2.52%
Antimony	0.01%	92.00%	0.06%
Arsenic	0.01%	4.21%	0.02%
Barium	0.02%	3.57%	0.08%
Beryllium	0.01%	0.49%	0.01%
Cadmium	0.01%	0.84%	0.01%
Calcium	0.87%	38.50%	5.25%
Chromium	0.01%	6.35%	0.05%
Cobalt	0.01%	2.12%	0.01%
Copper	0.01%	27.90%	0.13%
Iron	1.93%	49.10%	4.34%
Lanthanide	0.01%	4.94%	0.01%
Lead	0.01%	28.80%	0.10%
Lithium	0.01%	0.94%	0.01%
Magnesium	0.22%	31.10%	1.11%
Manganese	0.04%	21.50%	0.19%
Molybdenum	0.01%	48.20%	0.06%
Nickel	0.01%	10.50%	0.04%
Phosphorous	0.04%	33.20%	0.20%
Platinum	0.01%	0.28%	0.01%
Selenium	0.01%	0.17%	0.01%
Silver	0.01%	0.10%	0.01%
Sodium	0.26%	44.50%	1.59%
Strontium	0.01%	2.12%	0.03%
Tellurium	0.01%	0.10%	0.01%
Thallium	0.01%	0.10%	0.01%
Titanium	0.16%	6.25%	0.28%
Vanadium	0.01%	11.10%	0.02%
Yttrium	0.01%	0.08%	0.01%
Zinc	0.01%	22.50%	0.18%
Zircon	0.01%	1.71%	0.01%

modities, only one active Zircon mine and three active Rare Earths mines existed in the United States for these commodities at the time the NOHSM survey was conducted.

c. *Asbestos*

The NIOSH analytical method #9002 was used to analyze the bulk dust samples for seven forms of asbestos: actinolite asbestos, amosite (cummingtonite-grunerite), anthophyllite asbestos, chrysotile,

crocidolite (riebeckite), tremolite asbestos, and amphibole asbestos. This method uses polarized light microscopy and dispersion staining as a measuring technique.<sup>31</sup> Five forms of asbestos were found: actinolite asbestos, amosite (cummingtonite-grunerite), anthophyllite asbestos, chrysotile, and amphibole asbestos. Table 8 summarizes the bulk dust analysis for asbestos. The locations of NOHSM commodities where bulk dust samples containing asbestos were collected, are listed in Table 9.

Table 7

**COMMODITIES WITH HIGHEST PERCENT ARSENIC IN BULK DUST SAMPLES**

COMMODITY	#MINES SURVEYED	#SAMPLES	MAXIMUM	MEAN
Rare Earths	1	5	4.21%	0.93%
Zircon	1	5	0.67%	0.17%
Silver	11	44	2.39%	0.11%
Gold	20	72	0.37%	0.08%
Metal Ores, NEC*	2	4	0.14%	0.04%

\*NOTE: NEC represents Not Elsewhere Classified.

Table 8

**BULK DUST ASBESTOS RESULTS**

ASBESTOS VARIETY	NUMBER OF FACILITIES <sup>2</sup>	MAXIMUM PERCENTAGE FOUND	NON-ASBESTOS <sup>3</sup> COMMODITY ASSOCIATED MAXIMUM PERCENTAGE FOUND <sup>4</sup>
Actinolite	9	35.0	Vermiculite
Amosite	19	1.0	Several <sup>5</sup>
Anthophyllite	2	1.5	Talc, Soapstone, & Pyrophyllite
Chrysotile	18	4.0	Vermiculite
Other <sup>1</sup>	1	<1	Salt (Rock)

<sup>1</sup>Laboratory analysis reported *amphibole* for one sample.

<sup>2</sup>491 facilities were surveyed; one facility could appear in the counts for more than one variety of asbestos.

<sup>3</sup>Asbestos mines yielded percentages of actinolite (max=1.5%); amosite (max=7.5%); and chrysotile (max=90%).

<sup>4</sup>The association indicates the commodity being mined or processed at the facility which yielded the highest percentage of a given variety of asbestos. The sample may not be representative of the ore being mined or processed.

<sup>5</sup>Following non-asbestos commodities all yielded at least one sample which contained 1% amosite: aluminum, anthracite coal, bituminous coal, clay, gold, limestone (crushed & broken), manganese, nonmetallic minerals/ not elsewhere classified, perlite, salt (rock), sandstone (crushed & broken), slate (crushed & broken), traprock (crushed & broken), and vermiculite.

**TABLE 9**  
**LOCATIONS WITHIN NOHSM COMMODITIES WHERE BULK DUST SAMPLES**  
**CONTAINING ASBESTOS WERE COLLECTED**

<b>COMMODITY</b>	<b>LOCATION(S) ASSOCIATED WITH THE SAMPLE(S)</b>
Aluminum	Surface Mill
Anthracite Coal	Surface Shop
Asbestos	Surface Mill, Surface Shop, Surface Mine, Surface Miscellaneous
Bituminous Coal	Underground Mine, Underground Miscellaneous
Clay	Surface Mill
Copper	Underground Mine, Underground Shop
Gilsonite	Surface Grinding, Surface Mill
Granite (Crushed & Broken)	Surface Mine, Surface Miscellaneous
Gold	Surface Shop
Limestone (Crushed & Broken)	Surface Shop, Surface Crushing
Limestone (Dimension)	Surface Mill
Manganese	Surface Crushing, Surface Mill
Nonmetallic Minerals, NEC*	Surface Mine, Surface Mill, Surface Miscellaneous
Perlite	Surface Mill
Salt (Rock)	Underground Mill, Surface Shop
Sandstone (Crushed & Broken)	Surface Crushing, Surface Mill
Silver	Surface Miscellaneous
Slate (Crushed & Broken)	Surface Crushing, Surface Mill
Stone, Crushed & Broken, NEC*	Surface Mine, Surface Shop, Surface Crushing
Talc, Soapstone, & Pyrophyllite	Underground Mine, Surface Shop, Surface Grinding, Surface Miscellaneous, Surface Mill
Traprock (Crushed & Broken)	Surface Shop, Surface Crushing, Surface Miscellaneous, Surface Mill
Vermiculite	Surface Mine, Surface Shop, Surface Miscellaneous, Surface Mill

\*NOTE: NEC represents Not Elsewhere Classified.

## IX. DISCUSSION

The information presented in this report provides an indication of the range of occupational health-related agents found at U.S. mining facilities. This information is only a small portion of the NOHSM information which is available. NIOSH has constructed a database which makes the data from the NOHSM survey available to any interested party. NIOSH plans for use of these data in the future include:

- Encourage MSHA to use the NOHSM data in combination with other data (exposure data) to set regulatory priorities and write improved health standards; and to identify and determine research needs and priorities;
- Select the appropriate chemicals, mineral commodities, and occupations that require air sampling to determine the concentrations at which they are used or found; as required by Section 201 of the 1977 Federal Mine Safety and Health Amendments Act;
- Assist in setting priorities for mine-related occupational health research;
- Respond to questions from other parties regarding occupational health aspects of the mining industry; and
- Provide potential exposure data for use in NIOSH reports.

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## XI. APPENDIX A

### COMPOSITION OF THE NOHSM MINE SAMPLE

- <sup>\*1</sup> The mineral commodity is essentially the same name that MSHA uses for that MSHA SIC with two exceptions. NIOSH combined the Alumina (Mill) and Aluminum (Ore) commodities into one commodity, Aluminum and combined Clay, Ceramic & Refractory, NEC; Clay (Common); and Clay (Fire); into one commodity, Clay.
- <sup>\*2</sup> The MSHA SIC is a five digit coding classification for each mineral commodity that MSHA constructed from the four-digit Standard Industrial Classification used in all industries.
- <sup>\*3</sup> FID represents the NOHSM facility identification number for the surveyed mining facility.
- <sup>\*4</sup> The number of employees is defined as the total number of workers which were on the facility's payroll at the time the NOHSM survey was conducted.
- <sup>\*5</sup> SRU/NSRU represents either a self-representing unit or a non-self-representing unit and is defined in the sample selection section of this report.
- <sup>\*6</sup> These mining facilities were inactive at the time the NOHSM survey was being conducted, even though they were active when the mines were selected for that commodity.
- <sup>\*7</sup> This mining facility was selected under the Limestone (Crushed & Broken) commodity, but was already surveyed under the Vermiculite commodity at an earlier time (MSHA had changed that facility's standard industrial classification to Limestone (Crushed & Broken)).

NOTE: When a mineral commodity includes only SRU mining facilities as being surveyed, every mining facility in that mineral commodity was surveyed under NOHSM. In effect, a census of the commodity was performed.

MINERAL COMMODITY <sup>*1</sup>	MSHA SIC <sup>*2</sup>	FID <sup>*3</sup>	NUMBER OF EMPLOYEES <sup>*4</sup>	SRU/NSRU <sup>*5</sup>
Aluminum	10510	5	<sup>*6</sup>	NSRU
Aluminum	10510	6	1162	SRU
Aluminum	10510	7	<sup>*6</sup>	SRU
Aluminum	10510	9	111	SRU
Aluminum	10510	31	11	SRU
Aluminum	10510	52	<sup>*6</sup>	NSRU
Aluminum	10510	54	259	NSRU
Aluminum	10510	125	800	SRU
Aluminum	10510	128	807	SRU
Anthracite Coal	11110	432	5	NSRU
Anthracite Coal	11110	433	22	NSRU
Anthracite Coal	11110	434	56	SRU
Anthracite Coal	11110	435	34	NSRU
Anthracite Coal	11110	436	67	SRU
Anthracite Coal	11110	437	224	SRU
Anthracite Coal	11110	438	67	NSRU
Anthracite Coal	11110	439	7	NSRU
Anthracite Coal	11110	440	96	SRU
Anthracite Coal	11110	441	24	NSRU
Anthracite Coal	11110	442	14	SRU
Anthracite Coal	11110	443	90	SRU
Anthracite Coal	11110	444	10	NSRU
Anthracite Coal	11110	445	45	SRU
Anthracite Coal	11110	446	13	NSRU
Anthracite Coal	11110	447	10	NSRU
Anthracite Coal	11110	448	3	NSRU
Anthracite Coal	11110	449	17	NSRU
Anthracite Coal	11110	450	<sup>*6</sup>	NSRU
Anthracite Coal	11110	451	13	NSRU
Anthracite Coal	11110	452	7	NSRU

**APPENDIX A (CONT.)**

<b>MINERAL COMMODITY**</b>	<b>MSHA SIC**2</b>	<b>FID**3</b>	<b>NUMBER OF EMPLOYEES**4</b>	<b>SRU/NSRU**5</b>
Anthracite Coal	11110	453	27	NSRU
Anthracite Coal	11110	454	**	NSRU
Anthracite Coal	11110	455	3	NSRU
Anthracite Coal	11110	456	40	NSRU
Anthracite Coal	11110	457	**	NSRU
Anthracite Coal	11110	458	10	NSRU
Anthracite Coal	11110	459	27	NSRU
Anthracite Coal	11110	460	8	NSRU
Anthracite Coal	11110	461	79	NSRU
Anthracite Coal	11110	462	46	NSRU
Anthracite Coal	11110	463	6	NSRU
Anthracite Coal	11110	464	25	NSRU
Anthracite Coal	11110	465	41	NSRU
Aplite	14591	148	32	SRU
Aplite	14591	150	**	SRU
Asbestos	14991	16	123	SRU
Asbestos	14991	17	59	SRU
Asbestos	14991	21	92	SRU
Asbestos	14991	146	170	SRU
Barite	14720	632	53	NSRU
Barite	14720	642	22	NSRU
Barite	14720	652	12	NSRU
Barite	14720	665	22	NSRU
Barite	14720	691	14	NSRU
Beryl	10992	134	15	SRU
Beryl	10992	137	106	SRU
Bituminous Coal	12110	401	504	NSRU
Bituminous Coal	12110	402	119	NSRU
Bituminous Coal	12110	403	397	NSRU
Bituminous Coal	12110	404	480	NSRU
Bituminous Coal	12110	405	132	NSRU
Bituminous Coal	12110	406	455	NSRU
Bituminous Coal	12110	407	42	NSRU
Bituminous Coal	12110	408	352	NSRU
Bituminous Coal	12110	409	282	NSRU
Bituminous Coal	12110	410	53	NSRU
Bituminous Coal	12110	411	36	NSRU
Bituminous Coal	12110	412	276	NSRU
Bituminous Coal	12110	413	77	NSRU
Bituminous Coal	12110	414	719	NSRU
Bituminous Coal	12110	415	404	NSRU
Bituminous Coal	12110	416	786	NSRU
Bituminous Coal	12110	417	364	NSRU
Bituminous Coal	12110	418	**	NSRU
Bituminous Coal	12110	419	2	NSRU
Bituminous Coal	12110	420	**	NSRU
Bituminous Coal	12110	421	185	NSRU
Bituminous Coal	12110	422	**	NSRU
Bituminous Coal	12110	423	826	NSRU
Bituminous Coal	12110	424	219	NSRU
Bituminous Coal	12110	425	**	NSRU
Bituminous Coal	12110	426	37	NSRU
Bituminous Coal	12110	427	68	NSRU
Bituminous Coal	12110	428	51	NSRU
Bituminous Coal	12110	429	36	NSRU
Bituminous Coal	12110	430	414	NSRU

**APPENDIX A (CONT.)**

<b>MINERAL COMMODITY*1</b>	<b>MSHA SIC*2</b>	<b>FID*3</b>	<b>NUMBER OF EMPLOYEES*4</b>	<b>SRU/NSRU*5</b>
Bituminous Coal	12110	431	143	NSRU
Bituminous Coal	12110	466	736	NSRU
Bituminous Coal	12110	467	1182	NSRU
Boron Minerals	14741	15	226	SRU
Boron Minerals	14741	23	805	SRU
Boron Minerals	14741	24	229	SRU
Boron Minerals	14741	71	84	SRU
Cement	32410	606	88	NSRU
Cement	32410	610	192	NSRU
Cement	32410	611	180	NSRU
Cement	32410	618	127	NSRU
Cement	32410	631	226	NSRU
Cement	32410	640	147	NSRU
Cement	32410	656	175	NSRU
Cement	32410	674	36	NSRU
Cement	32410	682	97	NSRU
Cement	32410	708	317	NSRU
Clay	14530	201	69	NSRU
Clay	14530	214	56	NSRU
Clay	14530	218	204	NSRU
Clay	14530	228	225	NSRU
Clay	14530	229	320	SRU
Clay	14530	230	227	NSRU
Clay	14530	231	536	SRU
Clay	14530	232	37	NSRU
Clay	14530	233	132	NSRU
Clay	14530	234	462	NSRU
Clay	14530	235	12	NSRU
Clay	14530	236	40	NSRU
Clay	14530	237	366	SRU
Clay	14530	239	72	NSRU
Clay	14530	240	185	SRU
Clay	14530	241	233	NSRU
Clay	14530	242	299	NSRU
Clay	14530	243	354	SRU
Clay	14530	244	35	NSRU
Clay	14530	247	65	NSRU
Clay	14530	250	53	NSRU
Clay	14530	252	85	NSRU
Clay	14530	258	109	NSRU
Clay	14530	259	119	NSRU
Clay	14530	261	98	NSRU
Clay	14530	277	6	NSRU
Clay	14530	287	76	NSRU
Clay	14530	290	102	NSRU
Clay	14530	293	55	NSRU
Clay	14530	294	42	NSRU
Clay	14530	297	139	NSRU
Clay	14530	308	4	NSRU
Clay	14530	311	53	NSRU
Clay	14530	312	11	NSRU
Copper	10210	603	920	NSRU
Copper	10210	604	1716	NSRU
Copper	10210	645	804	SRU
Copper	10210	660	690	NSRU
Copper	10210	676	*	NSRU

**APPENDIX A (CONT.)**

<b>MINERAL COMMODITY**</b>	<b>MSHA SIC**2</b>	<b>FID**3</b>	<b>NUMBER OF EMPLOYEES**4</b>	<b>SRU/NSRU**5</b>
Copper	10210	680	**	NSRU
Copper	10210	681	**	NSRU
Copper	10210	696	460	NSRU
Feldspar	14593	549	6	NSRU
Feldspar	14593	552	126	NSRU
Feldspar	14593	571	20	NSRU
Fluorspar	14730	634	84	SRU
Fluorspar	14730	635	9	SRU
Fluorspar	14730	636	**	SRU
Fluorspar	14730	637	14	SRU
Fluorspar	14730	638	22	SRU
Fluorspar	14730	657	**	SRU
Fluorspar	14730	684	8	SRU
Gemstones	14992	57	36	SRU
Gemstones	14992	103	44	SRU
Gilsonite	14993	135	28	SRU
Gilsonite	14993	136	16	SRU
Gilsonite	14993	138	**	NSRU
Gilsonite	14993	141	3	NSRU
Gilsonite	14993	142	16	SRU
Gilsonite	14993	143	7	SRU
Gilsonite	14993	144	36	SRU
Gilsonite	14993	145	9	NSRU
Gold	10410	3	**	NSRU
Gold	10410	19	78	NSRU
Gold	10410	25	12	NSRU
Gold	10410	27	**	NSRU
Gold	10410	64	**	NSRU
Gold	10410	66	44	NSRU
Gold	10410	69	171	SRU
Gold	10410	70	300	SRU
Gold	10410	75	177	NSRU
Gold	10410	76	141	SRU
Gold	10410	77	222	SRU
Gold	10410	79	16	NSRU
Gold	10410	81	145	NSRU
Gold	10410	82	137	NSRU
Gold	10410	83	297	SRU
Gold	10410	84	148	SRU
Gold	10410	86	42	NSRU
Gold	10410	87	**	NSRU
Gold	10410	106	**	NSRU
Gold	10410	123	1473	SRU
Granite (Crushed & Broken)	14230	202	13	NSRU
Granite (Crushed & Broken)	14230	203	191	SRU
Granite (Crushed & Broken)	14230	205	46	NSRU
Granite (Crushed & Broken)	14230	209	110	NSRU
Granite (Crushed & Broken)	14230	220	45	NSRU
Granite (Crushed & Broken)	14230	223	24	NSRU
Granite (Crushed & Broken)	14230	225	50	NSRU
Granite (Crushed & Broken)	14230	226	40	NSRU
Granite (Crushed & Broken)	14230	227	63	NSRU
Granite (Crushed & Broken)	14230	238	33	NSRU
Granite (Crushed & Broken)	14230	245	14	NSRU
Granite (Crushed & Broken)	14230	246	36	NSRU
Granite (Crushed & Broken)	14230	255	53	NSRU

**APPENDIX A (CONT.)**

<b>MINERAL COMMODITY**1</b>	<b>MSHA SIC**2</b>	<b>FID**3</b>	<b>NUMBER OF EMPLOYEES**4</b>	<b>SRU/NSRU**5</b>
Granite (Crushed & Broken)	14230	260	31	NSRU
Granite (Crushed & Broken)	14230	266	156	SRU
Granite (Crushed & Broken)	14230	269	82	NSRU
Granite (Crushed & Broken)	14230	271	128	NSRU
Granite (Crushed & Broken)	14230	272	31	NSRU
Granite (Crushed & Broken)	14230	273	26	NSRU
Granite (Crushed & Broken)	14230	274	46	NSRU
Granite (Crushed & Broken)	14230	275	37	NSRU
Granite (Crushed & Broken)	14230	278	37	NSRU
Granite (Crushed & Broken)	14230	280	30	NSRU
Granite (Crushed & Broken)	14230	284	35	NSRU
Granite (Crushed & Broken)	14230	285	86	NSRU
Granite (Crushed & Broken)	14230	288	5	NSRU
Granite (Crushed & Broken)	14230	304	65	NSRU
Granite (Crushed & Broken)	14230	306	64	NSRU
Granite (Crushed & Broken)	14230	307	44	NSRU
Granite (Crushed & Broken)	14230	309	16	NSRU
Granite (Dimension)	14111	219	**6	NSRU
Granite (Dimension)	14111	221	15	NSRU
Granite (Dimension)	14111	224	4	NSRU
Granite (Dimension)	14111	248	6	NSRU
Granite (Dimension)	14111	256	10	NSRU
Granite (Dimension)	14111	257	8	NSRU
Granite (Dimension)	14111	263	21	NSRU
Granite (Dimension)	14111	286	5	NSRU
Granite (Dimension)	14111	292	25	NSRU
Granite (Dimension)	14111	295	28	NSRU
Granite (Dimension)	14111	301	70	NSRU
Granite (Dimension)	14111	310	20	NSRU
Gypsum	14920	8	42	NSRU
Gypsum	14920	43	49	SRU
Gypsum	14920	44	30	NSRU
Gypsum	14920	45	116	NSRU
Gypsum	14920	46	16	NSRU
Gypsum	14920	58	84	NSRU
Gypsum	14920	67	13	NSRU
Gypsum	14920	100	87	SRU
Gypsum	14920	112	**6	SRU
Gypsum	14920	113	24	NSRU
Gypsum	14920	126	40	NSRU
Gypsum	14920	127	41	NSRU
Gypsum	14920	147	50	NSRU
Iron Ore	10110	646	475	NSRU
Iron Ore	10110	647	89	NSRU
Iron Ore	10110	648	655	NSRU
Kyanite	14594	518	**6	SRU
Kyanite	14594	585	62	SRU
Kyanite	14594	586	16	SRU
Kyanite	14594	588	35	SRU
Lead/Zinc	10310	620	145	NSRU
Lead/Zinc	10310	651	118	NSRU
Lead/Zinc	10310	654	111	NSRU
Lead/Zinc	10310	675	123	NSRU
Lead/Zinc	10310	677	123	NSRU
Lead/Zinc	10310	679	246	NSRU
Leonardite	29900	99	3	SRU

**APPENDIX A (CONT.)**

<b>MINERAL COMMODITY*1</b>	<b>MSHA SIC*2</b>	<b>FID*3</b>	<b>NUMBER OF EMPLOYEES*4</b>	<b>SRU/NSRU*5</b>
Leonardite	29900	107	34	SRU
Leonardite	29900	108	15	SRU
Lime	32740	501	21	NSRU
Lime	32740	504	57	NSRU
Lime	32740	524	74	NSRU
Lime	32740	536	770	SRU
Lime	32740	541	28	NSRU
Lime	32740	563	139	NSRU
Lime	32740	564	207	NSRU
Lime	32740	569	112	NSRU
Lime	32740	582	94	SRU
Limestone (Crushed & Broken)	14220	503	112	NSRU
Limestone (Crushed & Broken)	14220	506	17	NSRU
Limestone (Crushed & Broken)	14220	509	80	NSRU
Limestone (Crushed & Broken)	14220	514	24	NSRU
Limestone (Crushed & Broken)	14220	520	11	NSRU
Limestone (Crushed & Broken)	14220	522	57	NSRU
Limestone (Crushed & Broken)	14220	523	36	NSRU
Limestone (Crushed & Broken)	14220	525	118	NSRU
Limestone (Crushed & Broken)	14220	526	13	NSRU
Limestone (Crushed & Broken)	14220	527	*7	NSRU
Limestone (Crushed & Broken)	14220	529	126	NSRU
Limestone (Crushed & Broken)	14220	534	330	NSRU
Limestone (Crushed & Broken)	14220	535	152	NSRU
Limestone (Crushed & Broken)	14220	537	15	NSRU
Limestone (Crushed & Broken)	14220	544	266	NSRU
Limestone (Crushed & Broken)	14220	556	140	NSRU
Limestone (Crushed & Broken)	14220	557	207	NSRU
Limestone (Crushed & Broken)	14220	559	132	NSRU
Limestone (Crushed & Broken)	14220	562	195	NSRU
Limestone (Crushed & Broken)	14220	566	197	NSRU
Limestone (Crushed & Broken)	14220	570	142	NSRU
Limestone (Crushed & Broken)	14220	572	69	NSRU
Limestone (Crushed & Broken)	14220	573	1	NSRU
Limestone (Crushed & Broken)	14220	574	34	NSRU
Limestone (Crushed & Broken)	14220	575	45	NSRU
Limestone (Crushed & Broken)	14220	577	11	NSRU
Limestone (Crushed & Broken)	14220	578	8	NSRU
Limestone (Crushed & Broken)	14220	583	88	NSRU
Limestone (Crushed & Broken)	14220	589	33	NSRU
Limestone (Crushed & Broken)	14220	592	16	NSRU
Limestone (Dimension)	14112	601	12	NSRU
Limestone (Dimension)	14112	650	38	NSRU
Limestone (Dimension)	14112	653	50	NSRU
Limestone (Dimension)	14112	692	3	NSRU
Limestone (Dimension)	14112	699	71	NSRU
Limestone (Dimension)	14112	703	20	NSRU
Lithium	14791	666	18	SRU
Lithium	14791	668	84	SRU
Lithium	14791	669	34	SRU
Lithium	14791	670	34	SRU
Magnesite	14595	65	135	SRU
Magnesite	14595	78	3	SRU
Magnesite	14595	104	19	SRU
Manganese	10614	217	38	SRU
Manganese	10614	249	26	SRU

**APPENDIX A (CONT.)**

<b>MINERAL COMMODITY**1</b>	<b>MSHA SIC**2</b>	<b>FID**3</b>	<b>NUMBER OF EMPLOYEES**4</b>	<b>SRU/NSRU**5</b>
Manganese	10614	291	5	SRU
Manganese	10614	296	12	SRU
Manganese	10614	299	21	SRU
Marble (Crushed & Broken)	14291	502	163	NSRU
Marble (Crushed & Broken)	14291	517	27	NSRU
Marble (Crushed & Broken)	14291	519	**6	NSRU
Marble (Dimension)	14113	516	54	NSRU
Marble (Dimension)	14113	533	7	NSRU
Marble (Dimension)	14113	576	**6	NSRU
Mercury	10920	72	59	SRU
Metal Ores, NEC	10990	4	3	SRU
Metal Ores, NEC	10990	28	32	SRU
Mica	14994	550	33	NSRU
Mica	14994	551	13	NSRU
Mica	14994	554	18	NSRU
Molybdenum	10615	621	390	SRU
Molybdenum	10615	633	445	SRU
Nonmetallic Minerals, NEC	14990	10	70	SRU
Nonmetallic Minerals, NEC	14990	14	18	NSRU
Nonmetallic Minerals, NEC	14990	22	534	SRU
Nonmetallic Minerals, NEC	14990	30	11	NSRU
Nonmetallic Minerals, NEC	14990	32	141	NSRU
Nonmetallic Minerals, NEC	14990	41	62	NSRU
Nonmetallic Minerals, NEC	14990	42	117	SRU
Nonmetallic Minerals, NEC	14990	50	94	NSRU
Nonmetallic Minerals, NEC	14990	51	94	NSRU
Nonmetallic Minerals, NEC	14990	73	40	NSRU
Nonmetallic Minerals, NEC	14990	74	112	SRU
Nonmetallic Minerals, NEC	14990	102	28	NSRU
Nonmetallic Minerals, NEC	14990	105	6	NSRU
Nonmetallic Minerals, NEC	14990	124	67	NSRU
Nonmetallic Minerals, NEC	14990	151	75	SRU
Nonmetallic Minerals, NEC	14990	152	17	NSRU
Oil Sand	13112	706	**6	SRU
Oil Shale	13111	625	155	SRU
Perlite	14996	1	11	NSRU
Perlite	14996	49	4	NSRU
Perlite	14996	88	30	SRU
Perlite	14996	94	47	SRU
Perlite	14996	95	62	SRU
Perlite	14996	98	18	SRU
Perlite	14996	116	10	NSRU
Phosphate Rock	14750	510	636	NSRU
Phosphate Rock	14750	511	477	NSRU
Phosphate Rock	14750	512	150	NSRU
Phosphate Rock	14750	513	114	NSRU
Phosphate Rock	14750	515	119	NSRU
Phosphate Rock	14750	521	89	NSRU
Phosphate Rock	14750	579	73	NSRU
Pigment Minerals	14792	587	29	SRU
Platinum Group	10993	655	372	SRU
Potash	14742	89	76	SRU
Potash	14742	90	219	SRU
Potash	14742	91	403	SRU
Potash	14742	92	322	SRU
Potash	14742	93	**6	SRU

**APPENDIX A (CONT.)**

<b>MINERAL COMMODITY**</b>	<b>MSHA SIC**</b>	<b>FID**3</b>	<b>NUMBER OF EMPLOYEES**4</b>	<b>SRU/NSRU**5</b>
Potash	14742	96	612	SRU
Potash	14742	97	**	SRU
Potash	14742	133	80	SRU
Pumice	14997	612	20	NSRU
Pumice	14997	619	27	NSRU
Pumice	14997	661	5	NSRU
Pyrites	14793	508	13	SRU
Rare Earths	10994	20	218	SRU
Salt (Evaporated)	28991	47	207	SRU
Salt (Evaporated)	28991	48	123	SRU
Salt (Rock)	14760	53	**	NSRU
Salt (Rock)	14760	55	252	SRU
Salt (Rock)	14760	56	290	SRU
Salt (Rock)	14760	101	269	NSRU
Salt (Rock)	14760	111	185	NSRU
Salt (Rock)	14760	131	205	SRU
Sand and Gravel	14410	602	12	NSRU
Sand and Gravel	14410	605	15	NSRU
Sand and Gravel	14410	607	12	NSRU
Sand and Gravel	14410	609	5	NSRU
Sand and Gravel	14410	613	23	NSRU
Sand and Gravel	14410	614	43	NSRU
Sand and Gravel	14410	615	8	NSRU
Sand and Gravel	14410	616	28	NSRU
Sand and Gravel	14410	617	14	NSRU
Sand and Gravel	14410	626	5	NSRU
Sand and Gravel	14410	630	19	NSRU
Sand and Gravel	14410	639	20	NSRU
Sand and Gravel	14110	641	**	NSRU
Sand and Gravel	14410	643	1	NSRU
Sand and Gravel	14410	644	36	NSRU
Sand and Gravel	14410	649	22	NSRU
Sand and Gravel	14410	658	9	NSRU
Sand and Gravel	14410	659	48	NSRU
Sand and Gravel	14410	663	9	NSRU
Sand and Gravel	14410	667	56	NSRU
Sand and Gravel	14410	671	16	NSRU
Sand and Gravel	14410	673	18	NSRU
Sand and Gravel	14410	678	3	NSRU
Sand and Gravel	14410	683	31	NSRU
Sand and Gravel	14410	686	**	NSRU
Sand and Gravel	14410	690	12	NSRU
Sand and Gravel	14410	693	17	NSRU
Sand and Gravel	14410	701	21	NSRU
Sand and Gravel	14410	702	12	NSRU
Sand and Gravel	14410	707	**	NSRU
Sandstone (Crushed & Broken)	14292	11	45	NSRU
Sandstone (Crushed & Broken)	14292	12	7	NSRU
Sandstone (Crushed & Broken)	14292	13	21	NSRU
Sandstone (Crushed & Broken)	14292	18	69	NSRU
Sandstone (Crushed & Broken)	14292	29	64	NSRU
Sandstone (Crushed & Broken)	14292	37	150	SRU
Sandstone (Crushed & Broken)	14292	38	41	NSRU
Sandstone (Crushed & Broken)	14292	39	94	NSRU
Sandstone (Crushed & Broken)	14292	40	19	NSRU
Sandstone (Crushed & Broken)	14292	59	69	NSRU

**APPENDIX A (CONT.)**

<b>MINERAL COMMODITY*1</b>	<b>MSHA SIC**2</b>	<b>FID**3</b>	<b>NUMBER OF EMPLOYEES**4</b>	<b>SRU/NSRU**5</b>
Sandstone (Crushed & Broken)	14292	60	4	NSRU
Sandstone (Crushed & Broken)	14292	61	47	NSRU
Sandstone (Crushed & Broken)	14292	68	49	NSRU
Sandstone (Crushed & Broken)	14292	109	72	NSRU
Sandstone (Crushed & Broken)	14292	110	19	NSRU
Sandstone (Crushed & Broken)	14292	114	14	NSRU
Sandstone (Crushed & Broken)	14292	115	127	SRU
Sandstone (Crushed & Broken)	14292	122	64	NSRU
Sandstone (Crushed & Broken)	14292	129	43	NSRU
Sandstone (Crushed & Broken)	14292	130	39	NSRU
Sandstone (Crushed & Broken)	14292	132	**	NSRU
Sandstone (Crushed & Broken)	14292	153	168	SRU
Sandstone (Crushed & Broken)	14292	154	**	NSRU
Sandstone (Crushed & Broken)	14292	155	5	NSRU
Sandstone (Dimension)	14114	505	13	NSRU
Sandstone (Dimension)	14114	555	75	NSRU
Sandstone (Dimension)	14114	558	68	NSRU
Shale (Common)	14596	627	39	NSRU
Shale (Common)	14596	664	40	NSRU
Shale (Common)	14596	672	14	NSRU
Shale (Common)	14596	685	67	NSRU
Shale (Common)	14596	700	45	NSRU
Silver	10440	2	6	NSRU
Silver	10440	26	115	NSRU
Silver	10440	33	260	SRU
Silver	10440	34	607	SRU
Silver	10440	35	187	SRU
Silver	10440	36	152	NSRU
Silver	10440	63	355	SRU
Silver	10440	80	48	NSRU
Silver	10440	85	100	NSRU
Silver	10440	139	125	NSRU
Silver	10440	140	248	SRU
Slate (Crushed & Broken)	14293	204	18	SRU
Slate (Crushed & Broken)	14293	206	30	SRU
Slate (Crushed & Broken)	14293	212	14	SRU
Slate (Crushed & Broken)	14293	222	57	SRU
Slate (Crushed & Broken)	14293	276	73	SRU
Slate (Crushed & Broken)	14293	279	**	SRU
Slate (Crushed & Broken)	14293	283	14	SRU
Slate (Dimension)	14115	282	31	NSRU
Slate (Dimension)	14115	300	13	NSRU
Slate (Dimension)	14115	302	**	NSRU
Slate (Dimension)	14115	305	142	NSRU
Sodium Compounds	14744	156	1096	SRU
Sodium Compounds	14744	157	513	SRU
Sodium Compounds	14744	159	356	SRU
Sodium Compounds	14744	160	291	SRU
Stone, Crushed & Broken, NEC	14290	207	20	NSRU
Stone, Crushed & Broken, NEC	14290	208	44	NSRU
Stone, Crushed & Broken, NEC	14290	210	8	NSRU
Stone, Crushed & Broken, NEC	14290	211	131	SRU
Stone, Crushed & Broken, NEC	14290	213	3	NSRU
Stone, Crushed & Broken, NEC	14290	215	11	NSRU
Stone, Crushed & Broken, NEC	14290	251	12	NSRU
Stone, Crushed & Broken, NEC	14290	253	14	NSRU

**APPENDIX A (CONT.)**

<b>MINERAL COMMODITY<sup>*1</sup></b>	<b>MSHA SIC<sup>*2</sup></b>	<b>FID<sup>*3</sup></b>	<b>NUMBER OF EMPLOYEES<sup>*4</sup></b>	<b>SRU/NSRU<sup>*5</sup></b>
Stone, Crushed & Broken, NEC	14290	262	7	NSRU
Stone, Crushed & Broken, NEC	14290	264	48	NSRU
Stone, Crushed & Broken, NEC	14290	265	43	NSRU
Stone, Crushed & Broken, NEC	14290	267	134	SRU
Stone, Crushed & Broken, NEC	14290	268	14	NSRU
Stone, Crushed & Broken, NEC	14290	270	**	NSRU
Stone, Crushed & Broken, NEC	14290	281	20	NSRU
Stone, Crushed & Broken, NEC	14290	289	25	NSRU
Stone, Crushed & Broken, NEC	14290	303	18	NSRU
Stone, Crushed & Broken, NEC	14290	313	67	NSRU
Stone, Crushed & Broken, NEC	14290	314	21	NSRU
Stone, Dimension, NEC	14110	216	18	NSRU
Stone, Dimension, NEC	14110	254	9	NSRU
Stone, Dimension, NEC	14110	298	**	NSRU
Talc, Soapstone & Pyrophyllite	14960	507	3	NSRU
Talc, Soapstone & Pyrophyllite	14960	538	112	NSRU
Talc, Soapstone & Pyrophyllite	14960	539	51	NSRU
Talc, Soapstone & Pyrophyllite	14960	540	5	NSRU
Talc, Soapstone & Pyrophyllite	14960	547	143	NSRU
Talc, Soapstone & Pyrophyllite	14960	553	9	NSRU
Talc, Soapstone & Pyrophyllite	14960	580	16	NSRU
Titanium	10996	628	245	SRU
Titanium	10996	629	129	SRU
Traprock (Crushed & Broken)	14294	530	127	NSRU
Traprock (Crushed & Broken)	14294	531	75	NSRU
Traprock (Crushed & Broken)	14294	532	**	NSRU
Traprock (Crushed & Broken)	14294	542	19	NSRU
Traprock (Crushed & Broken)	14294	545	17	NSRU
Traprock (Crushed & Broken)	14294	546	**	NSRU
Traprock (Crushed & Broken)	14294	548	33	NSRU
Traprock (Crushed & Broken)	14294	560	30	NSRU
Traprock (Crushed & Broken)	14294	561	12	NSRU
Traprock (Crushed & Broken)	14294	565	70	NSRU
Traprock (Crushed & Broken)	14294	567	145	NSRU
Traprock (Crushed & Broken)	14294	581	80	NSRU
Traprock (Crushed & Broken)	14294	584	43	NSRU
Traprock (Crushed & Broken)	14294	590	18	NSRU
Traprock (Crushed & Broken)	14294	591	128	NSRU
Traprock (Crushed & Broken)	14294	593	43	NSRU
Traprock (Dimension)	14116	528	**	SRU
Traprock (Dimension)	14116	568	**	SRU
Trona	14743	158	749	SRU
Uranium	10941	622	51	NSRU
Uranium	10941	662	181	NSRU
Uranium	10941	687	66	NSRU
Uranium	10941	688	52	NSRU
Uranium	10941	694	65	NSRU
Uranium	10941	698	**	NSRU
Uranium	10941	705	**	NSRU
Uranium - Vanadium Ores	10940	623	**	SRU
Uranium - Vanadium Ores	10940	624	22	SRU
Uranium - Vanadium Ores	10940	689	23	SRU
Uranium - Vanadium Ores	10940	695	**	SRU
Uranium - Vanadium Ores	10940	697	**	SRU
Uranium - Vanadium Ores	10940	704	**	SRU
Vanadium	10942	608	229	SRU

APPENDIX A (CONT.)

<b>MINERAL COMMODITY**1</b>	<b>MSHA SIC**2</b>	<b>FID**3</b>	<b>NUMBER OF EMPLOYEES**4</b>	<b>SRU/NSRU**5</b>
Vermiculite	14998	62	133	SRU
Vermiculite	14998	117	18	SRU
Vermiculite	14998	118	51	SRU
Vermiculite	14998	119	21	SRU
Vermiculite	14998	120	11	SRU
Vermiculite	14998	121	11	SRU
Vermiculite	14998	149	32	SRU
Zircon	10997	543	29	SRU

**APPENDIX B  
PART I - QUESTIONNAIRE**

**Question**

1. Card Code 1
2. Revision Code 010  
Surveyor ID \_\_\_\_\_
3. Date Survey Started  $\frac{\quad}{M} \frac{\quad}{M} \frac{\quad}{D} \frac{\quad}{D} \frac{\quad}{Y} \frac{\quad}{Y}$  (mo/day/yr)
4. Facility Identification Number \_\_\_\_\_

**GENERAL FACILITY INFORMATION**

**Question**

5. Rank the commodities produced at this facility from highest production to lowest production based on the number of tons mined or processed per year.

Commodity Rank	Commodity Name	SIC Code
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____
8	_____	_____

**Question**

6. Identify the most advanced processing state for each commodity that is shipped from the facility by its state of processing, according to the following system:

	Commodity Rank	Processing State	Specify Other
A Raw Ore (no milling or preparation)	1	_____	_____
B Crushed	2	_____	_____
C Ground	3	_____	_____
D Concentrated (cleaned)	4	_____	_____
E Roasted	5	_____	_____
F Other	6	_____	_____
	7	_____	_____
	8	_____	_____

**APPENDIX B (CONT.)**

**Question**

7. Approximately how many years has this facility been involved in any mining or milling activity?

\_\_\_ Years (If "unknown" code "998")

**Question**

8. Record the approximate number of workers currently employed in each of the following types of subunits, by shift, divided by production and maintenance.

Subunit Name	PRODUCTION (SHIFTS)				MAINTENANCE (SHIFTS)			
	1	2	3	4	1	2	3	4
Underground mining	---	---	---	---	---	---	---	---
Underground shop	---	---	---	---	---	---	---	---
Underground mill	---	---	---	---	---	---	---	---
Open pit	---	---	---	---	---	---	---	---
Surface shop operation	---	---	---	---	---	---	---	---
Surface crushing operation	---	---	---	---	---	---	---	---
Surface grinding operation	---	---	---	---	---	---	---	---
Surface flotation and reagents	---	---	---	---	---	---	---	---
Surface miscellaneous	---	---	---	---	---	---	---	---
Surface mill operation	---	---	---	---	---	---	---	---
Coal preparation plant	---	---	---	---	---	---	---	---

**Question**

9. How many people are on your payroll for all shifts at the present time? Include all production, maintenance, and administrative workers.

Males      \_\_\_\_\_

Females    \_\_\_\_\_

Total      \_\_\_\_\_

**Question**

10. Has this facility any formal agreement with the employees concerning occupational health?

- 1 Yes
- 2 No

**APPENDIX B (CONT.)**  
**MEDICAL SERVICES**

**Question**

11. Is there a formally established health unit at this facility?

- 1 Yes, physician in charge
- 2 Yes, registered nurse in charge
- 3 Yes, licensed practical nurse in charge
- 4 Yes, other in charge
- 5 No

**Question**

12. Do you have on your payroll one or more on-site physicians to give your employees medical care?

- 1 Yes, full-time
- 2 Yes, part-time
- 3 No

**Question**

13. Do you have a formal arrangement with any outside source (physicians or clinics) to give your employees access to the care of a physician for health-related problems (as opposed to care for traumatic injury)?

- 1 Yes, physician will travel to this facility on call
- 2 Yes, at clinic (not at this facility)
- 3 Yes, physician is based at this facility either full or part-time
- 4 No

**Question**

14. Estimate the average number of physician hours that are devoted to the care of employees at your facility per week.

\_\_\_ hours per week (If "unknown" code "998")

**Question**

15. Does this facility have one or more nurses on the payroll to provide care for employees?

- 1 Yes
- 2 No (Code a "0" in the blank for N/A in question 16)

**Question**

16. How many registered nurses and licensed practical nurses are on the payroll at this facility, and who provide direct care for your employees?

N/A \_\_\_\_\_  
RN \_\_\_\_\_  
LPN \_\_\_\_\_

**APPENDIX B (CONT.)**

**Question**

17. Estimate the average number of nursing hours that are devoted to the employees of your facility per week.

\_\_\_ hours (If "unknown" code "998")

**Question**

18. Do you provide the following examinations or tests to all or to selected groups of employees on a periodic basis?

	No	Yes, All	Yes, All Exec. & Mgmt Only	Yes, All Production Workers Only	Yes, for Selected Mgmt and or Production Workers
Ophthalmology	1	2	3	4	5
Audiometric	1	2	3	4	5
Blood tests	1	2	3	4	5
Urine tests	1	2	3	4	5
Pulmonary function	1	2	3	4	5
Chest X-rays	1	2	3	4	5
Allergy/Sensitization	1	2	3	4	5
Immunizations (flu, etc.)	1	2	3	4	5

**Question**

19. Before new employees are hired or placed, are they required to take a medical examination?

1      2      3      4      5

**Question**

20. Do you record health information about a new employee on some regular form?

1      2      3      4      5

**Question**

21. Do you require medical examinations of your employees who return to work after an illness?

1      2      3      4      5

## APPENDIX B (CONT.)

### Question

22. Do you require medical examinations of your employees when their employment is terminated? (Exit examination)

1            2            3                            4                            5

### Question

23. How long are medical records and other health information records retained?

— — — Years            (If "forever" code "999")  
                                  (If "unknown" code "998")

## INDUSTRIAL HYGIENE PRACTICES

### Question

24. Has your facility received industrial hygiene services on a consulting basis during the past 12 months?

- 1 Yes, from government sources
- 2 Yes, from non-government sources
- 3 Yes, from both government and non-government sources
- 4 No

### Question

25. Do you employ full-time individuals at this facility whose major responsibilities are in the area of prevention of illnesses?

- 1 Yes, but not a certified industrial hygienist.
- 2 Yes, a certified industrial hygienist.
- 3 Yes, both certified and non-certified industrial hygienists.
- 4 No (Code a "0" in the blank for N/A in question 26)

## APPENDIX B (CONT.)

### Question

26. How many full-time occupational health specialists are employed at this facility?

\_\_\_ Total

\_\_\_ N/A

For each of those individuals, please write in the appropriate activity number from the activity clusters listed below:

			<b>CLUSTER NO.</b>
Individual #1	_____	A:	Administers (directs, manages) plans and develops programs, advises top level management.
Individual #2	_____		
Individual #3	_____	B:	Inspects work place to identify hazards, investigates to determine the cause of illnesses.
Individual #4	_____		
Individual #5	_____	C:	Analyzes plans or specs. to identify hazards, develops operating procedures to control hazards.
Individual #6	_____		
Individual #7	_____	D:	Provides education and training.
Individual #8	_____	E:	Performs and analyzes tests to monitor for the presence of dusts, gases, etc.
Individual #9	_____		
Individual #10	_____	F:	Performs engineering design to control hazards.
Individual #11	_____		
Individual #12	_____		

### Question

27. Do you have a program under which you regularly or periodically monitor the presence of physical agents such as heat, vibration, radiation, noise, or other types of physical agents?

1 Yes (Circle "1" or "2" for each physical agent listed below:)

	Yes	No
1. Heat	1	2
2. Vibration	1	2
3. Radiation	1	2
4. Noise	1	2
5. Other	1	2

2 No (Code a "0" in the blank for N/A in question 28)

## APPENDIX B (CONT.)

### Question

28. How long do you retain the records of the monitoring program?

- \_\_ Years (If "forever" code "99")  
(If "unknown" code "98")  
\_\_\_ N/A

### Question

29. Do you have a program under which you regularly or periodically monitor the health-related presence of fumes, gases, mists, dusts, or vapors?

1 Yes, we have a monitoring program (circle 1 or 2 for each agent listed below)

	Yes	No
1. Fumes	1	2
2. Gases	1	2
3. Mists	1	2
4. Dusts	1	2
5. Vapors	1	2

2 No (Code a "0" in the blank for N/A in question 30, 31, and 32)

### Question

30. How is this monitoring conducted?

N/A \_\_\_\_\_

- 1 Sample collection with laboratory analysis (Code a "0" in the blank for N/A in question 31)  
2 Direct-reading instruments  
3 Both

### Question

31. Which types of direct-reading instruments are used in the monitoring program? Circle "1" or "2" for each type listed below:

N/A \_\_\_\_\_

	Yes	No
1. Direct mass measurement tests	1	2
2. Fibrous aerosol monitors	1	2
3. Detector tubes	1	2
4. Infrared (I.R.) gas monitors	1	2
5. Ultraviolet (U.V.) gas monitors	1	2
6. Gas chromatograph monitors	1	2
7. Electrochemical monitors	1	2
8. Other "wet" chemical methods	1	2

**APPENDIX B (CONT.)**

**Question**

32. How long do you retain the records of the monitoring program?

NOTE: DO NOT ASK THIS QUESTION IN COAL MINES.

N/A \_\_\_\_\_

-- Years (If "forever" code "99")  
(If "unknown" code "98")

**Question**

33. Are there areas in this facility in which personal protective health devices or equipment are required or recommended?

- 1 Yes, required
- 2 Yes, recommended
- 3 Yes, both
- 4 No (Code a "0" in the blank for N/A in questions 34, 35, 36, and 37)

**Question**

34. Who has been designated to see to it that personal protective health devices and equipment are serviced and maintained?

N/A \_\_\_\_\_

- 1 individual employees
- 2 employer representative
- 3 both
- 4 no one
- 5 other, specify \_\_\_\_\_

**Question**

35. In those instances where employees refuse to wear protective health devices or fail to wear them properly, are corrective measures taken?

N/A \_\_\_\_\_

- 1 Yes
- 2 No (Code a "0" in the blank for N/A in Questions 36 and 37)

**Question**

36. Do those corrective measures involve economic penalties?

N/A \_\_\_\_\_

- 1 Yes
- 2 No (Code a "0" in the blank for N/A in Questions 37)

**APPENDIX B (CONT.)**

**Question**

37. Have any economic penalties been assessed in the past 12 months?

N/A \_\_\_\_\_

- 1 Yes
- 2 No, we know of no instances where violations of company policy have occurred within the last 12 months.
- 3 No, although we know that there was at least one violation of company policy within the last 12 months.

**GENERAL RECORDKEEPING AND MISCELLANEOUS INFORMATION**

**Question**

38. How long are personnel records on terminated employees retained?

\_\_\_ Years (If "*forever*", code "999")  
(If "*unknown*", code "998")

**Question**

39. Do you keep employee absenteeism records?

- 1 Yes, showing specific nature of illness where appropriate
- 2 Yes, showing only the type of absence
- 3 Yes, without showing the type of absence
- 4 No

**Question**

40. What is your rate of unscheduled absenteeism?

\_\_\_ days per employee per year (If "*unknown*", code "998")

**Question**

41. What is your turnover rate among permanent employees in the non-administrative areas?

\_\_\_ % per year

**Question**

42. What year was your personnel record system begun?

Year system begun \_\_\_ (If "*unknown*", code "998")

**APPENDIX B (CONT.)**

**Question**

43. Which of the following items are contained in that system?

- 1 Social security number
- 2 Date of birth
- 3 Date(s) of employment with this facility
- 4 Jobs held at this facility
- 5 Employment history at other facilities
- 6 Sex of worker
- 7 Worker's race
- 8 Worker's home address

**Question**

44. Who is in the best position to provide information on the amount of each chemical or trade name substance used at this facility per year? Will this person(s) be available later today or tomorrow?

The inventory contact person(s) is:

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**Question**

45. List the names and the approximate percent composition of any minerals known to occur in the material being mined.

<b>Mineral Name</b>	<b>Percent</b>
_____	____
_____	____
_____	____
_____	____
_____	____
_____	____
_____	____
_____	____

**APPENDIX B (CONT.)**

**Question**

46. If your mine uses diesel equipment in an underground location, when were the first diesel units brought into the mine?

- 1 We use no diesels in the underground locations of this mine.
- 2 We use diesels in underground locations of this mine, and the first diesel was brought into the mine during \_ \_ \_.

(If "unknown" code "998")

**Question**

47. Does this facility have any equipment that uses PCB-containing fluids?

- 1 Yes
- 2 No
- 3 Unknown

**Question**

48. Does this facility rotate shifts, and if so how often?

- 1 Yes, this facility rotates shifts on a \_\_\_\_\_ basis.
- 2 No, this facility does not use shift rotation.

**Question**

49. Does this facility have a Labor-Management Health Committee?

- 1 Yes, we have a Labor-Management Health Committee.
- 2 No, we do not have a Labor-Management Health Committee.

**Question**

50. Could you provide me with a geologic description of the strata (or rock formation) in which this mine operates?

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## APPENDIX B (CONT.)

### Question

51. If you have an assay laboratory, or if you have access to assay reports, then may I have as an example a copy of each unique type of assay report?
- 1 Yes, we have an assay laboratory at this facility, but you may not have a copy of an assay report.
  - 2 Yes, we have an assay laboratory at this facility, and you may have a copy of an assay report.
  - 3 Yes, you may have a copy of each type of assay report, but we have no assay laboratory at this facility. Our reports come from an off-facility laboratory.
  - 4 No, we have no assay laboratory at this facility.

## **APPENDIX C**

### **DEFINITIONS, GUIDELINES, AND PROCEDURES FOR PREPARING AND CONDUCTING THE NOHSM QUESTIONNAIRE**

This appendix contains the definitions, guidelines, and procedures which the NOHSM surveyor followed for preparing and conducting the questionnaire, but these guidelines were not given to mine management. The information pertaining to each of the questions in this appendix is organized in the following manner:

**Question** Repeats the question and possible responses, as shown on the questionnaire.

**Intent** The purpose of the question, in terms of the information to be elicited from management.

**Definition** The explanation of the key terms or concepts in connection with the question.

**Procedure** Under this optional heading will be found the detailed instructions that may be necessary to properly fill out the more complicated portions of the questionnaire.

**Inclusions** Explanations and/or examples of situations, conditions, events, etc., to be included as the possible response(s).

**Exclusions** Explanations and/or examples of situations, conditions, events, etc., to be excluded as the possible response(s).

## APPENDIX C (CONT.)

### Question

1. Card Code 1
2. Revision Code 0 1 0  
Surveyor ID \_\_\_\_\_
3. Date Survey Started                   (mo/day/yr)  
M M D D Y Y
4. Facility Identification Number                    
1 2 3 4 5 6

### Intent

To specifically identify the NOHSM surveyor, the date that the survey was begun, and the unique facility surveyed.

### Definitions

The **card code** is preprinted in item number 1, and identifies the record format to be used in computer processing of the Part I questionnaire. The **revision code** is pre-printed in item number 2, and identifies the Part I questionnaire as a NOHSM form. The **surveyor ID**, **date survey started**, and **Facility Identification Number (FID)** are as previously defined.

### Inclusions

This data is entered for all facilities surveyed.

### Exclusions

Not applicable.

### Procedures

Not applicable.

**APPENDIX C (CONT.)  
GENERAL FACILITY INFORMATION**

**Question**

5. Rank the commodities produced at this facility from highest production to lowest production based on the number of tons mined or processed per year.

Commodity Rank	Commodity Name	SIC Code
1	_____	-----
2	_____	-----
3	_____	-----
4	_____	-----
5	_____	-----
6	_____	-----
7	_____	-----
8	_____	-----

**Intent**

To determine the major commodities being produced at this facility.

**Definitions**

Commodity names are listed in Appendix C, Table C1.

**Procedures**

Only use commodity codes listed in Appendix C, Table C1. If the mine management lists a commodity not listed in Appendix C, Table C1, then have them select the most appropriate commodity from Appendix C, Table C1. If a commodity cannot be selected from Table C1, then record the name given by mine management, and code a "99998" under the SIC Code column indicating that the commodity SIC code is unknown. Record the name of the commodity with the highest production rank in the row labeled Commodity Rank 1, the commodity with the next highest rank in the row labeled Commodity Rank 2, etc. **PRINT ALL WORDS IN CAPITAL LETTERS.**

**APPENDIX C (CONT.)**

**TABLE C1**

**MSHA SIC CODES AND ASSOCIATED MINERAL COMMODITIES**

<b>MSHA SIC CODE</b>	<b>MINERAL COMMODITY</b>	<b>MSHA SIC CODE</b>	<b>MINERAL COMMODITY</b>
28191	Alumina (Mill)**	10990	Metal Ores, NEC+
10510	Aluminum Ore**	14994	Mica
10991	Antimony*	10615	Molybdenum
14591	Aplite	10616	Nickel*
14991	Asbestos	14990	Nonmetallic Minerals, NEC+
14720	Barite	13112	Oil Sand*
10992	Beryl	13111	Oil Shale
14741	Boron Minerals	14995	Peat (Before 1979)*
28193	Bromine*	14996	Perlite
14592	Brucite*	14750	Phosphate Rock
32410	Cement	14792	Pigment Mineral
14790	Chemical and Fertilizer, NEC*+	10993	Platinum Group
10611	Chromite*	14742	Potash
14590	Clay, Ceramic & Refractory, NEC**+	14740	Potash, Soda & Borate Minerals, NEC*+
14550	Clay (Common)**	14997	Pumice
14530	Clay (Fire)**	14793	Pyrites
11110	Coal, Anthracite	10994	Rare Earths
12110	Coal, Bituminous	28992	Salt (In Brine)*
10612	Cobalt*	28991	Salt (Evaporated)
10613	Columbium - Tantalum*	14760	Salt (Rock)
10210	Copper Ore	14410	Sand & Gravel
14593	Feldspar	14292	Sandstone (Crushed & Broken)
10610	Ferrous Ores*	14114	Sandstone (Dimension)
14730	Fluorspar	14596	Shale (Common)
14531	Garnet*	14295	Silica Sand*
14992	Gemstones	10440	Silver Ores
14993	Gilsonite	14293	Slate (Crushed & Broken)
10410	Gold (Lode and Placer)	14115	Slate (Dimension)
14230	Granite (Crushed & Broken)	14744	Sodium Compounds
14111	Granite (Dimension)	14290	Stone, Crushed & Broken, NEC+
14920	Gypsum	14110	Stone, Dimension NEC+
28190	Industrial Chemicals, NEC*+	14794	Strontium*
10110	Iron Ore	14770	Sulfur*
14594	Kyanite	14960	Talc, Soapstone & Pyrophyllite
10310	Lead and/or Zinc Ore	10995	Tin Ore*
29900	Leonardite	10996	Titanium
32740	Lime	14294	Traprock (Crushed & Broken)
14220	Limestone (Crushed & Broken)	14116	Traprock (Dimension)*
14112	Limestone (Dimension)	14743	Trona
14791	Lithium	10617	Tungsten*
14595	Magnesite	10941	Uranium
10614	Manganese	10940	Uranium - Vanadium Ores
14291	Marble (Crushed & Broken)	10942	Vanadium
14113	Marble (Dimension)	14998	Vermiculite
10920	Mercury	10997	Zircon

\*NOTE: Commodity inactive during the NOHSM survey period. MSHA SIC Source is the technical documentation for the MSHA address and employment file.

\*\*NOTE: NIOSH combined the Alumina (Mill) and Alumina (Ore) commodities into one commodity, Aluminum; and the three clay commodities into one commodity, Clay.

+NOTE: NEC represents Not Elsewhere Classified.

## APPENDIX C (CONT.)

### Question

6. Identify the most advanced processing state for each commodity that is shipped from the facility by its state of processing, according to the following system:

	Commodity Rank	Processing State	Specify Other
A Raw Ore (no milling or preparation)	1	-	_____
B Crushed	2	-	_____
C Ground	3	-	_____
D Concentrated (cleaned)	4	-	_____
E Roasted	5	-	_____
F Other	6	-	_____
	7	-	_____
	8	-	_____

### Intent

To characterize the extent of processing applied to the commodities listed in response to Question #5.

### Inclusions

Many commodities have terms more specific to certain types of processing. Enter any term preferred by the company as code **F** and record the term on the blank line provided labeled as "*Specify Other*".

### Exclusions

None

### Procedures

For each ranked commodity listed in Question #5, enter the most advanced processing code (A-F) for that commodity. All commodities may not be processed to the same degree. Record only the processing state of the commodity being processed at the time of the survey. If they are not currently processing a commodity at the time of the survey, record what they last processed.

## APPENDIX C (CONT.)

### Question

7. Approximately how many years has this facility been involved in any mining or milling activity?

\_\_\_ \_\_\_ Years (If "unknown" code "998")

### Intent

To determine the length of time that this facility has been used for the same basic type of work.

### Definitions

This activity is not restricted to the current major activity at the facility. For example, if the facility began as a mine in 1930, but in 1950 a major mineral processing plant was built, and today 80% of the activity revolves around the mineral processing plant, then use the 1930 date in calculating the years of activity.

### Inclusions

In the situation where information is not available as to how long this activity has been carried out in this facility, use the earliest date indicated by the person who is being interviewed.

### Exclusions

Not applicable.

### Procedures

Always round up to the nearest whole number. For example, if the response is given as 3.25 years, enter the number as "4".

## APPENDIX C (CONT.)

### Question

8. Record the approximate number of workers currently employed in each of the following types of subunits, by shift, divided by production and maintenance.

Subunit Name	PRODUCTION (SHIFTS)				MAINTENANCE (SHIFTS)			
	1	2	3	4	1	2	3	4
Underground mining	---	---	---	---	---	---	---	---
Underground shop	---	---	---	---	---	---	---	---
Underground mill	---	---	---	---	---	---	---	---
Open pit	---	---	---	---	---	---	---	---
Surface shop operation	---	---	---	---	---	---	---	---
Surface crushing operation	---	---	---	---	---	---	---	---
Surface grinding operation	---	---	---	---	---	---	---	---
Surface flotation and reagents	---	---	---	---	---	---	---	---
Surface miscellaneous	---	---	---	---	---	---	---	---
Surface mill operation	---	---	---	---	---	---	---	---
Coal preparation plant	---	---	---	---	---	---	---	---

### Intent

To describe the employment pattern of the major subunits of the facility from the viewpoint of the management personnel being interviewed. To guide the surveyor during the walk-through as to the major subunits and the numbers of production and maintenance workers and shifts at each subunit. To assist the surveyor in determining whether more than one shift must be surveyed. This information is to be used during the computer editing of the walk-through data to ensure all locations have been surveyed, and all of the workers have been accounted for at each location.

### Definitions

**Shift** is defined as the working period for the employees and may be more or less than eight hours in length per day.

**Production** shifts are those shifts during which material is being mined, and the workers assigned to the production category are primarily involved in production activities, although they may perform minor maintenance tasks.

**Maintenance** shifts are those shifts during which machinery is being repaired, lubricated, and prepared for production activities. If the maintenance shift normally performs these functions during the first part of the maintenance shift, and then produces a product, then the shift should be coded as a maintenance shift.

**Open Pit** includes all types of surface mines.

## APPENDIX C (CONT.)

### Procedures

Enter the response given by management in response to this question. Enter nothing for any subunits with no employees on one or more shifts. For those facilities that have unusual shifts (e.g., four-day work week or three-day work week), explain the irregularities on the back of a Part III form. Code all shop operations under production unless the shift is a maintenance shift.

### Question

9. How many people are on your payroll for all shifts at the present time? Include all production, maintenance, and administrative workers.

Males	— — — —
Females	— — — —
Total	— — — —

### Intent

To determine the total number of employees working in the facility being surveyed, and to determine the number of males and females.

### Definitions

**People**, as used in this question, refers to employees of the facility who are paid directly by the facility. This definition includes members of labor organizations who are working under union contract between the mining company and the union.

### Inclusions

Include full-time and part-time personnel who are **paid directly by the facility**. Include maintenance and repair personnel and janitorial staff. Include **individual** consultants working directly for the facility. Include those personnel who may work solely on a commission basis. Include contract workers who are a part of routine mine operations. Include administrative personnel assigned to the facility being surveyed.

### Exclusions

Do **not** include persons working at another mine site, if that site is not a part of the facility being surveyed.

### Question

10. Has this facility any formal agreement with the employees concerning occupational health?

1 Yes  
2 No

### Intent

To assist in determining the relationship between agreements concerning occupational health and the existence of health services.

## APPENDIX C (CONT.)

### Definitions

An **agreement** is any document formally agreed upon with employees or their designated representative.

### Inclusion

Union and non-union related agreements.

### Exclusions

Any agreement which is not written and signed by representatives of both parties to the agreement.

## MEDICAL SERVICES

### Question

11. Is there a formally established health unit at this facility?

- 1 Yes, physician in charge
- 2 Yes, registered nurse in charge
- 3 Yes, licensed practical nurse in charge
- 4 Yes, other in charge
- 5 No

### Intent

To determine if there is a company policy to maintain basic health resources or capabilities at the facility site.

### Definitions

**Health unit** suggests that a specific work area or portion of the facility has been reserved solely for the examination and/or treatment of employees and that there is a permanent staff (either full-time or part-time) responsible for operating this unit.

**Physician** refers to a person who possesses a state or federal government-recognized medical degree, such as an M.D. or D.O., and is licensed to diagnose and treat diseases and disorders of the human body or a particular disease, age, or occupation group.

**Registered Nurse (RN)** is a person meeting the educational, legal, and training requirements to practice as required by a state board of nursing.

**Licensed Practical Nurse (LPN)** is a person who meets the requirements of the state for such a designation, and is licensed by the state.

**Facility being surveyed** means all mine property covered by the MSHA mine identification number assigned to this facility.

### Inclusions

When more than one response applies, use the lowest applicable code number. For example, if a physician is in charge two days a week and a nurse is in charge the other days, code the response as "1".

## APPENDIX C (CONT.)

### Exclusions

Do not count, as a health unit, a resting room that is reserved for female employees as required under certain federal and/or state regulations. Exclude the situation where a room is used to store first-aid supplies and no one is assigned the responsibility for providing health care to employees. Do not include situations where rooms are reserved for specific purposes other than basic health care (for example, a room used only for audiometric testing).

### Procedures

If a "paramedic" is in charge, then "4" should be coded.

### Question

12. Do you have on your payroll one or more on-site physicians to give your employees medical care?

- 1 Yes, full-time
- 2 Yes, part-time
- 3 No

### Intent

To determine if the facility employs a physician for the purpose of providing the employees with access to the care of a physician.

### Definitions

**Physician:** See Question #11.

**Full-time:** At least one individual on duty during all hours of operation of the facility.

**Part-time:** At least one individual is designated, but such individuals are not on duty during all hours of operation of the facility.

### Exclusions

Exclude all physicians who are not engaged in the direct provision of medical services to the employees. Do not include any physicians whose primary responsibility is other than direct health care. Exclude all physicians provided by a third-party provider under contract to the facility.

### Question

13. Do you have a formal arrangement with any outside source (physicians or clinics) to give your employees access to the care of a physician for health-related problems (as opposed to care for traumatic injury)?

- 1 Yes, physician will travel to this facility on call
- 2 Yes, at clinic (not at this facility)
- 3 Yes, physician is based at this facility either full- or part-time
- 4 No

## APPENDIX C (CONT.)

### Intent

To determine if formal arrangements for medical care are provided for facility employees and the type of arrangements used in the provision of such care.

### Definitions

**Physician:** See Question #11.

### Inclusions

Include **only** those arrangements made by the facility's management. If more than one arrangement was made, use the arrangement with the lowest coding number. For example, if it is determined that a physician will travel to the facility on call and that a formal arrangement exists with an outside clinic, the proper response is "1". A medical center should be considered a clinic. Include general health programs such as mental health and substance abuse.

### Exclusions

Do **not** include medical service arrangements provided by unions, associations or other groups unless a formal arrangement exists with the facility's management. Exclude emergency treatment in a hospital. Exclude Blue Cross/Blue Shield type third-party payment plans. Exclude arrangements required by regulation, such as the NIOSH mandated X-ray program for coal miners.

### Procedures

If the facility has no direct formal arrangement with a physician (codes 1, 2, or 3), but does, as a policy, pay medical bills incurred by employees at a physician of the employee's choice, then code "2" (yes, at clinic) is the proper response.

### Question

14. Estimate the average number of physician hours that are devoted to the care of employees at your facility per week.

\_\_ \_\_ \_\_ hours per week (If "unknown" code "998")

### Intent

To determine the aggregate level of physician effort provided to the facility.

### Definitions

**Physician:** See Question #11.

### Inclusions

When Question #12 is answered by Code 1 or 2, include an average weekly figure based upon the last 12 months or the best available estimate.

Include the physician hours, if available, spent with the employees when the response to Question #13 is either Code 1, 2, or 3. If the response to Question #13 is Code 2 due to a facility

## APPENDIX C (CONT.)

policy of paying the medical bills incurred by an employee with a physician of the employee's choice, the company is at least indirectly aware of physician hours devoted to the employees of the facility, resulting in a positive numerical response to this question.

### Exclusions

Do **not** include times spent by physicians in the facility, other than that spent caring for the employees. For example, physicians involved in medical research would not be counted.

### Question

15. Does this facility have one or more nurses on the payroll to provide care for employees?

- 1 Yes
- 2 No (Code a "0" in the blank for N/A in question 16)

### Intent

To determine if nursing services are available to employees on a regular basis through direct employment of a nurse or nurses.

### Definitions

**Nurse (RN and LPN):** Defined in Question #11.

**Regular basis** refers only to situations where a nurse is scheduled to be on duty at periodic intervals throughout the week.

### Inclusions

Include registered licensed practical nurses specifically assigned to provide nursing services to the facility's employees on a regular basis.

### Exclusions

Do **not** include nurses on the facility's payroll whose job function does not involve taking care of the facility's employees.

Do **not** include student nurses, or other paramedical personnel undergoing on-the-job training. Do **not** include visiting nurses from corporate headquarters even if "*detailed*" or "*assigned*" to this facility for long periods of time. Do **not** include visiting nurses from city, county, state, and other government agencies.

**APPENDIX C (CONT.)**

**Question**

16. How many registered nurses and licensed practical nurses are on the payroll at this facility, and who provide direct care for your employees?

N/A \_\_\_\_\_

RN \_\_\_\_\_

LPN \_\_\_\_\_

**Intent**

To determine the number of different individual nurses employed at this facility.

**Inclusions**

Include all categories specified in Question #15.

Include all nurses who are employed by the facility and are giving nursing aid to employees. This also includes those nurses who may not be present at the facility. Example: Nurses who visit sick employees should be included. Include supervisory nurses.

**Exclusions**

Do not include nurses who may be employed by the facility but do not perform nursing services for the employees.

Do not include visiting nurses from city, county, state, and other government agencies. Do not include visiting nurses from corporate headquarters even in those circumstances where the nurses have been "detailed" or "assigned" to this facility for long periods of time.

Do not include nurses supplied under contract with a third party provider, or through an arrangement not made by management.

**Question**

17. Estimate the average number of nursing hours that are devoted to the employees of your facility per week.

\_\_\_\_ hours (If "unknown" code "998")

**Intent**

To determine the aggregate level of medical nursing effort provided to the facility.

**Definitions**

Nurse: Defined in Question #15.

## APPENDIX C (CONT.)

### Inclusions

Include the hours spent by all categories of nurses. Include the time of nurses who provide nursing services on a contract basis. Include the time of nurses from corporate headquarters who are assigned to provide nursing services to this facility.

Include the time of other nurses providing care to employees if the facility, as a policy, pays for such nursing service. This may occur regardless of the coded response to Question #15.

### Exclusions

Do not include nursing hours that may be devoted to facility employees when the nurses are employed by a government agency.

Exclude the time of nurses not spent in the provision of medical care. Example: full-time nurse who is assigned to teach sanitation techniques to neighborhood improvement group.

Do not include visiting nurses from city, county, state, and other government agencies.

### Question

18. Do you provide the following examinations or tests to all or to selected groups of employees on a periodic basis?

	NO	Yes, All	Yes, All Exec. & Mgmt Only	Yes, All Production Workers Only	Yes, for Selected Mgmt and or Production Workers
Ophthalmology	1	2	3	4	5
Audiometric	1	2	3	4	5
Blood tests	1	2	3	4	5
Urine tests	1	2	3	4	5
Pulmonary function	1	2	3	4	5
Chest X-rays	1	2	3	4	5
Allergy/Sensitization	1	2	3	4	5
Immunizations (flu, etc.)	1	2	3	4	5

### Intent

To determine the number of facilities that have a preventive medical program for their employees, and the types of examinations or tests provided.

### Definitions

**All:** When an employer provides an examination to each employee within a designated type (every employee, executive and management, production workers) without regard to that employee's exposure to potential occupational safety and health hazards. **Selected:** When an employer provides an examination to some of, but not all of the employees.

## APPENDIX C (CONT.)

### NOTE

MSHA regulations require audiometric testing only in those coal mines in which employees have had previous over-exposures to noise.

MSHA regulations require all underground coal mines to provide chest X-rays to all production employees who want them.

These definitions apply equally to the code responses for Questions #18 through #22.

### Inclusions

As listed.

### Exclusions

Not applicable.

### Procedures

At coal mines, the surveyor shall code "*chest X-rays*" as category 4, without asking the coal mine representative. When the response refers to employees in certain occupations (for example, maintenance personnel) and also managers, use the Code "5".

### Question

19. Before new employees are hired or placed, are they required to take a medical examination?
- |  |   |   |   |   |   |
|--|---|---|---|---|---|
|  | 1 | 2 | 3 | 4 | 5 |
|--|---|---|---|---|---|

### Intent

To determine the number of facilities that examine the status of an employee's health at the time of his joining the organization, or of placing him in a new position.

### NOTE

MSHA has no regulations for either coal or metal and non-metal mines requiring medical examinations prior to hiring or placement.

### Definitions

**Medical examination** means those tests, procedures, and observations of an employee's health status that are performed by, or under the supervision of a physician. This includes a consultation and evaluation review process of those tests and procedures by a physician. **Physician** is defined in Question #11.

### Inclusions

Include all types of examinations. This could be just a basic interview session with a physician or a comprehensive physical examination involving X-rays, blood, urine, and other laboratory tests, etc.

## APPENDIX C (CONT.)

Include examinations performed by an employee's private physician when the results of the examination are submitted to the facility's management.

Sight screening tests, color blindness tests, and/or audio screening tests are to be included when the results are supervised by a physician.

### Exclusions

Do not include examinations of a health nature which are not performed by or under the supervision of a physician.

### Question

20. Do you record health information about a new employee on some regular form?

1      2      3      4      5

### Intent

To determine if the facility records health information about new employees and to determine for which type of new employees such information is recorded.

### NOTE

MSHA has no regulations for either coal or metal and non-metal mines requiring the mine operator to record health information about new employees.

### Definitions

**Health information** refers to any data regarding an employee's health. **Regular form** is any type of documentation which is standardized and is retained as part of the employee's file or as part of his medical history.

### Inclusions

Include **all** written records of information, including responses to questions pertaining to the employee's health as long as the recording process is consistent for the designated employee group.

Information that is obtained from pre-employment physicals or detailed medical histories should be included.

Include **any** kind of information that is retained concerning employee's health. For example, a recorded question which asks: "*How is your health*"? and to which the reply is "*good, fair, or poor*" should be included.

Include any information about physical defects of a new employee.

### Exclusions

Do **not** include situations where medical information is obtained from employees, but is not retained in the files as a permanent record. Exclude information on physiological tests when obtained for other than health purposes.

## APPENDIX C (CONT.)

### Question

21. Do you require medical examinations of your employees who return to work after an illness?
- |  |   |   |   |   |   |
|--|---|---|---|---|---|
|  | 1 | 2 | 3 | 4 | 5 |
|--|---|---|---|---|---|

### Intent

To determine the level of medical care provided by the facility.

### NOTE

MSHA has no regulations in either coal or metal and non-metal mines requiring the mine operator to require medical examinations of employees who return to work after an illness.

### Definitions

**Medical examination** is defined in Question #19

**Return-to-work** refers to a medical examination that is required when an employee returns to work after an absence due to illness or injury.

### Inclusions

Include situations where a facility policy may not cover all employees. For example, if the facility requires the special medical examinations only for employees in certain occupations, or requires them only for certain categories of absence, a positive response should be recorded.

Include those situations where the examination is not performed at the facility but the employee submits a written statement that their personal physician considers the employee **fit to return to work**.

### Exclusions

Do not include situations where the returning employee may **voluntarily** visit the facility's medical unit or their own physician. **Require** is the key word.

### Question

22. Do you require medical examinations of your employees when their employment is terminated? (Exit examination)
- |  |   |   |   |   |   |
|--|---|---|---|---|---|
|  | 1 | 2 | 3 | 4 | 5 |
|--|---|---|---|---|---|

### Intent

To determine the level of medical care provided by the facility.

## APPENDIX C (CONT.)

### NOTE

MSHA has no regulations in either coal, metal, or non-metal mines requiring the mine operator to provide medical examinations of employees when their employment is terminated.

### Definitions

**Exit Examination:** A medical examination that is performed when a worker's employment at the facility is ended.

### Inclusions

Include all examinations, complete or partial, performed by or under the supervision of a physician.

### Exclusions

Do not include situations where the terminating employee may voluntarily visit the facility's medical unit or their own physician. **Require** is the key word.

### Question

23. How long are medical records and other health information records retained?

\_\_ \_\_ \_\_ Years (If "*forever*" code "999")  
(If "*unknown*" code "998")

### Intent

To determine the facility's policy with respect to the retention of personal health and medical records.

### NOTE

MSHA has no regulations in either coal, metal, or non-metal mines requiring the mine operator to retain medical and health information records for any length of time.

### Inclusions

Include records that are kept at the facility or corporate headquarters.

### Exclusions

Exclude personnel systems and timekeeping systems unless they make specific provision for the inclusion of medical and health-related records. Exclude records kept by private physicians, clinics or hospitals.

## APPENDIX C (CONT.)

### INDUSTRIAL HYGIENE PRACTICES

#### Question

24. Has your facility received industrial hygiene services on a consulting basis during the past 12 months?

- 1 Yes, from government sources
- 2 Yes, from non-government sources
- 3 Yes, from both government and non-government sources
- 4 No

#### Intent

To determine if the facility has received industrial hygiene advice or consultation from outside sources during the past 12 months.

#### Definitions

**Industrial Hygiene:** See Question #25.

**Consulting Basis:** Advice, consultation, or services obtained from persons not employed at the facility.

#### Inclusions

Include visits from federal, state, and local governmental authorities where the consulting was provided as a service and **was not** for reasons of compliance or enforcement of health standards. Include visits from corporate headquarters personnel if they conducted an industrial hygiene walk-through investigation or on-site inspection. Include consultation from specialists employed by insurance companies.

#### Exclusions

Exclude visits from federal, state, and local government agencies made for the purpose of compliance or enforcement. Exclude all inspections and visits not conducted on the behalf of facility or corporate management such as those conducted on the behalf of the unions.

## APPENDIX C (CONT.)

### Question

25. Do you employ full-time individuals at this facility whose major responsibilities are in the area of prevention of illnesses?

- 1 Yes, but not a certified industrial hygienist.
- 2 Yes, a certified industrial hygienist.
- 3 Yes, both certified and non-certified industrial hygienists.
- 4 No (Code a "0" in the blank for N/A in question 26)

### Intent

To determine if the facility employs individuals whose primary responsibilities are to prevent illnesses.

### Definitions

**Illness Prevention:** That art which is devoted to the recognition, evaluation, and control of occupational health hazards. Illness prevention activities include, but are not limited to: recognition of environmental conditions and stresses associated with work and work operations, the evaluation, on the basis of training and experience and with the aid of quantitative measurements, of the magnitude of these stresses in terms of potential impairment of the employee's health and well-being; prescribing methods to control, eliminate, or reduce such stresses, collecting samples of dusts, gases, and other potentially toxic workplace materials for analysis; evaluating the adequacy of ventilation around certain work areas; and developing education programs for employees.

**Industrial Hygienist:** Person whose primary responsibilities include the recognition, evaluation, or control of occupational health hazards.

**Certified Industrial Hygienist:** An industrial hygienist who has completed the requirements of the American Board of Industrial Hygiene, Akron, Ohio.

### Inclusions

Include in the "*illness prevention*" category, all persons with job titles such as Industrial Hygienist, Industrial Health Engineer, Environmental Health Engineer, Health Specialist, etc. if they are responsible for performing health-related duties as more than 50% of their job.

### Exclusions

Exclude all personnel involved in the direct delivery of medical care. Do not include doctors, nurses or paramedics who spend less than 50% of their time in the illness prevention activities described above. Exclude all federal, state, and local government officials; they are not full-time employees of the facility. Exclude all visiting corporate headquarters personnel, even in those situations where such personnel have been "*detailed*" or "*assigned*" to work at the facility for long periods of time.

### Procedures

The thrust of this question is to determine if such personnel are employed at the facility. If none are employed, circle "*no*" (code response "4") and a "0" for Question #26 and skip to Question #27. If the answer is "*yes*", determine in which category (certified or non-certified) the company employs individuals. If unable to classify, or if the facility employs people in both

## APPENDIX C (CONT.)

categories, circle "yes, both certified and non-certified", (code response "3") and proceed to Question #26. If classification is possible, circle the appropriate response code, and proceed to Question #26.

### Question

26. How many full-time occupational health specialists are employed at this facility?

\_\_\_ \_\_\_ Total

\_\_\_ N/A

For each of those individuals, please write in the appropriate activity number from the activity clusters listed below:

		CLUSTER NO.
Individual	#1 ___	A: Administers (directs, manages) plans and develops programs, advises top level management.
Individual	#2 ___	
Individual	#3 ___	B: Inspects work place to identify hazards, investigates to determine the cause of illnesses.
Individual	#4 ___	
Individual	#5 ___	
Individual	#6 ___	C: Analyzes plans or specs. to identify hazards, develops operating procedures to control hazards.
Individual	#7 ___	
Individual	#8 ___	D: Provides education and training.
Individual	#9 ___	
Individual	#10 ___	E: Performs and analyzes tests to monitor for the presence of dusts, gases, etc.
Individual	#11 ___	
Individual	#12 ___	F: Performs engineering design to control hazards.

### Intent

To determine the number of individuals involved in the preventive aspects of occupational health at this facility, to categorize them in general terms, and to describe their major duties.

### Definitions

For definitions of **health (illness prevention)** see Question #25. A full time occupational health specialist is an employee who spends more than 50% of their time on illness prevention activities.

## APPENDIX C (CONT.)

### Inclusions

Inclusions are the same as in Question #25.

### Exclusions

Exclusions are the same as in Question #25.

### Procedures

Enter the total number of persons on the appropriate line. For each individual enter the cluster letter which best describes the major portion of their duties.

### Question

27. Do you have a program under which you regularly or periodically monitor the presence of physical agents such as heat, vibration, radiation, noise, or other types of physical agents?

1 Yes (Circle "1" or "2" for each physical agent listed below:)

	Yes	No
1. Heat	1	2
2. Vibration	1	2
3. Radiation	1	2
4. Noise	1	2
5. Other	1	2

2 No (Code a "0" in the blank for N/A in question 28)

### Intent

To determine the existence of a company policy in maintaining a program for the monitoring of certain physical agents as part of its occupational health program, and the awareness of management of potentially hazardous physical agents.

### NOTE

MSHA regulations require the monitoring of noise at intervals of at least every six months for each miner and worksite for all coal mining facilities.

MSHA regulations require the monitoring of radiation in all underground uranium mines, and in all other mines where radon daughter-produced radiation has equaled or exceeded a 0.1 working level.

### Definitions

**Regularly or Periodically monitor** applies only to established programs which monitor environmental levels of physical agents on a regular and/or predictable basis.

**Other** refers to any physical agent management claims to monitor that is not a form of heat, Svibration, radiation, or noise.

## APPENDIX C (CONT.)

### Inclusions

Include tests with instruments only when the intent of the tests is to determine if employee health is potentially at risk.

Include tests performed by outside consultants at the direction of management, such as contract monitoring.

Include both compliance and non-compliance measurements.

### Exclusions

Do not include any measurements that are simply measuring process conditions or any environmental measurements which are done where no employee exposures could potentially exist. For example, the measuring of temperature and humidity inside a sealed vessel in a process loop should not be counted. Exclude measurements that are taken for the sole reason of determining if a fire or explosion potential exists.

Do not include those monitoring tests that are not routinely performed. For example, special monitoring of new machines during the start-up and initial use stages should not be included.

Exclude monitoring tests where industrial hygiene is not part of the rationale behind the conduct of the tests, such as monitoring of vibration or heat conditions for sensitive equipment.

### Procedures

The surveyor shall code the responses for radiation as "yes" (circle code 1) for all underground uranium mines, without asking the mine representative.

### Question

28. How long do you retain the records of the monitoring program?

\_\_\_ Years            (If "forever" code "99")  
                          (If "unknown" code "98")  
\_\_\_ N/A

### Intent

To determine the length of time that the company retains the records from its program of monitoring physical hazards.

### Exclusions

Use same exclusions as in Question # 27.

## APPENDIX C (CONT.)

### Question

29. Do you have a program under which you regularly or periodically monitor the health-related presence of fumes, gases, mists, dusts, or vapors?

1 Yes, we have a monitoring program (circle 1 or 2 for each agent listed below)

	Yes	No
1. Fumes	1	2
2. Gases	1	2
3. Mists	1	2
4. Dusts	1	2
5. Vapors	1	2

2 No (Code a "0" in the blank for N/A in questions 30, 31, and 32)

### Intent

To determine the existence of a company policy in monitoring certain conditions for the protection of the employees, and the awareness of management to potentially hazardous substances.

### NOTE

MSHA regulations in coal, metal, and non-metal mines require the monitoring for methane gas, but not in the health hazard concentration range. The methane monitoring is conducted in the explosive gas range, and is conducted for safety reasons that are unrelated to health concerns.

MSHA regulations require monitoring for coal mine dust in all underground coal mines. MSHA regulations also require monitoring for coal mine dust in all surface mining facilities, but the MSHA District Manager must withdraw this requirement if the operator is able to maintain continuing compliance with the applicable respirable dust standard during at least a one-year period.

### Definitions

**Regularly monitor** applies only to established programs which monitor levels of chemical materials on a regular, predictable basis.

### Inclusions

Include tests taken with instruments **only** where the intent of the tests is to determine if employee's health is potentially at risk.

Include situations where the facility's management has the monitoring performed by someone other than the facility's management, such as monitoring by contract. Include monitoring programs established and/or conducted by or for the facility's insurance carriers provided they are performed regularly or periodically. **NOTE:** A "Yes" response should be coded if the program includes any part of the facility.

### Exclusions

Do **not** include any measurements that are simply measuring process conditions or any environmental measurements which are done where no employee exposures could potentially exist. For example, the measuring of temperature and humidity inside a sealed vessel in a process loop should **not** be counted.

## APPENDIX C (CONT.)

Exclude measurements that are taken for the sole reason of determining if a fire or explosion potential exists.

Exclude monitoring for methane gas in coal, metal, and non-metal mines in which the monitoring is conducted in the explosive gas range, with the purpose of preventing explosions.

Do not include those monitoring tests that are not routinely performed. For example, special monitoring of new machines during the start-up and initial use stages should not be included.

Exclude monitoring tests where industrial hygiene is not part of the rationale behind the conduct of the tests, such as monitoring of dust conditions for fire insurance reasons or monitoring of process conditions.

Exclude all programs conducted by federal, state, or local governmental agencies and officials, exclude any one-time studies of the facility or areas within the facility. Exclude all non-periodic consultations by consultants, insurance carriers and others.

### Procedures

If the mine monitors for any of the above agents, circle the 1 beside the yes, and proceed to circle the 1 (for yes) or the 2 (for no) for each agent as appropriate.

The surveyor shall code the response for dusts by circling the 1 for all coal mines, without asking this question of the coal mine representative.

If a given agent is not monitored, then the surveyor should circle 2 for that agent.

If none of the agents are monitored, circle the 2 beside the word "No".

### Question

30. How is this monitoring conducted?

N/A \_\_\_\_\_

- 1 Sample collection with laboratory analysis (Code a "0" in the blank for N/A in question 31)
- 2 Direct-reading instruments
- 3 Both

### Intent

To categorize the normal pattern of monitoring for this facility.

### Inclusions

Inclusions are noted in Question #29.

### Exclusions

Exclusions are noted in Question #29.

APPENDIX C (CONT.)

Question

31. Which types of direct-reading instruments are used in the monitoring program? Circle "1" or "2" for each type listed below:

N/A \_\_\_\_\_

	Yes	No
1. Direct mass measurement tests	1	2
2. Fibrous aerosol monitors	1	2
3. Detector tubes	1	2
4. Infrared (I.R.) gas monitors	1	2
5. Ultraviolet (U.V.) gas monitors	1	2
6. Gas chromatograph monitors	1	2
7. Electrochemical monitors	1	2
8. Other "wet" chemical methods	1	2

Intent

To categorize the current practices of the facility with regard to direct-reading instrumentation.

Procedures

Make sure that either "yes" or "no" (code response "1" or "2") is circled for each applicable instrument type.

Question

32. How long do you retain the records of the monitoring program?

NOTE: DO NOT ASK THIS QUESTION IN COAL MINES.

N/A \_\_\_\_\_

\_\_\_ Years (If "forever" code "99")  
(If "unknown" code "98")

Intent

To determine the length of the time that the company retains the records from its program of monitoring fumes, gases, mists, dusts, etc.

NOTE

MSHA requires that dust sample records for samples taken in the exhaust air to be retained for 2 years.

MSHA requires that personal dust sample records be retained until the person would have been 75 or until 2 years after the person's death.

Procedures

For coal mines, the surveyor shall enter "CO" to designate the regulatory requirements.

## APPENDIX C (CONT.)

### Question

33. Are there areas in this facility in which personal protective health devices or equipment are required or recommended?

- 1 Yes, required
- 2 Yes, recommended
- 3 Yes, both
- 4 No (Code a "0" in the blank for N/A in questions 34, 35, 36, and 37)

### Intent

To determine the facility management's policy towards the use of personal protective devices and equipment.

### NOTE

MSHA regulations require personal protective devices only in those areas cited for over-exposure to some health hazard.

### Definitions

**Required** means that there is a formal company policy that some or all employees must use personal protective devices as a condition of employment. This policy may or may not be enforced.

**Recommended** indicates that the facility's management encourages employees to use personal protective devices but it is **not** a condition of employment.

**Personal protective health devices and equipment** include, but are not limited to, ear plugs, gloves, rubberized clothing, welding helmets, and/or goggles, and respirators.

### Inclusions

If only one work area or department requires or recommends the usage of personal protective devices, the response should be coded "1" or "2", as applicable. If a facility has some areas that **recommend** usage and some areas that **require** usage, the response should be coded "3". Include respirators.

Include only personal protective devices or equipment used for health hazards as opposed to safety hazards.

### Exclusions

Exclude cases where personal protective gear is worn because an employee wants to do so -- but use of protective devices is not required or recommended by the employer. The response in such cases should be coded "4".

Do not include safety equipment, such as hard hats, safety shoes or glasses.

### Procedures

If the response to Question #33 is "no", skip to Question #38.

## APPENDIX C (CONT.)

### Question

34. Who has been designated to see to it that personal protective health devices and equipment are serviced and maintained?

N/A \_\_\_\_\_

- 1 individual employees
  - 2 employer representative
  - 3 both
  - 4 no one
  - 5 other, specify \_\_\_\_\_
- 

### Intent

To determine if formal responsibility has been assigned to an individual or individuals for maintaining personal protective health devices and equipment in proper operating order.

### NOTE

MSHA regulations only require that personal protective health devices be clean and sanitary. They do not specify who is to maintain them in that condition, nor do they have any requirement that the personal protective device be in proper operating order.

### Definitions

**Servicing and/or maintaining** refers to such activities as cleaning or changing filters or cartridges in respirators, repairing straps of safety goggles or face shields, filling of air tanks, repairing of broken lenses, etc.

**Personal protective health devices** are defined in Question #33.

### Inclusions

*“Designated”* is the key word in Question #34. If the employer has directed the employees to maintain their own equipment and provides cleaning apparatus and work space, the response is coded “1”. If the employees normally maintain their own equipment, but they have not been specifically charged or directed by management, the response would be coded “4”. If the employer has established procedures whereby a union or a governmental agency is to maintain the equipment, the response should be coded “5” with an explanation entered on the *“specify”* line. If the employer has assigned a specific employee to maintain personal protective devices for all employees, then code “2”.

### Exclusions

Not applicable.

### Procedures

If items 1 through 4 do not apply, code 5 and specify who maintains the equipment on the line following the word *“specify”*. If both the individual employees and another person(s) maintain the equipment, then circle 1 for the individual employee.

**APPENDIX C (CONT.)**

**Question**

35. In those instances where employees refuse to wear protective health devices or fail to wear them properly, are corrective measures taken?

N/A \_\_\_\_\_

- 1 Yes
- 2 No (Code a "0" in the blank for N/A in Questions 36 and 37)

**Intent**

To determine if the employer has a functioning system of corrective actions for improper wearing of protective health devices, equipment or clothing.

**Definitions**

**Corrective action** is formal action by plant management personnel against the individual involved.

**Improper** means wearing of non-functional clothing or devices, including respirators rendered non-functional due to improper facial fit.

**Inclusions**

Include such actions as personnel actions (transfer, removal, suspension, etc.). Exclude labor union sanctions against the employee.

**Exclusions**

Corrective counselling is not considered a corrective measure.

**Procedures**

If the response to Question #35 is "no", skip to Question #38.

**Question**

36. Do those corrective measures involve economic penalties?

N/A \_\_\_\_\_

- 1 Yes
- 2 No (Code a "0" in the blank for N/A in Questions 37)

**Intent**

To determine the extent to which employees are penalized by the employer because of failure to comply with facility requirements for proper wearing of protective clothing, devices, and equipment.

## APPENDIX C (CONT.)

### Definitions

**Economic penalties** are defined as official disciplinary actions taken by management which result in a financial loss to the affected employee, either directly or indirectly.

### Inclusions

Include all official disciplinary actions which result in financial penalties to the employee. Such actions include fines, dismissal, reduction in work hours, reassignment or transfer (at a lower wage rate), suspension, loss of seniority credits, loss of shift differential, etc.

### Exclusions

Exclude all actions which are not taken on behalf of plant management, such as labor union sponsored sanctions or fines against the employee.

Do not include medical or related costs incurred by the individual as a consequence of the improper wearing of protective devices, clothing or equipment, i.e., the costs to the employee purchasing skin lotion because he was not wearing chemical resistant gloves.

### Procedures

This question is asked only if the response to Question #35 is "yes". If the response to Question #36 is "no", skip to Question #38.

### Question

37. Have any economic penalties been assessed in the past 12 months?

N/A \_\_\_\_\_

- 1 Yes
- 2 No, we know of no instances where violations of company policy have occurred within the last 12 months.
- 3 No, although we know that there was at least one violation of company policy within the last 12 months.

### Intent

To determine whether formal corrective actions involving economic penalties have been taken in the last 12-month period as a result of employee refusal to wear protective health devices, or employee failure to wear such devices properly.

### Definitions

**Economic penalties** are defined in Question #36.

### Inclusions

As in Question #36.

### Exclusions

As in Question #36.

### Procedures

This question is asked only of those who respond affirmatively to Question #36.

## APPENDIX C (CONT.)

### GENERAL RECORDKEEPING AND MISCELLANEOUS INFORMATION

#### Question

38. How long are personnel records on terminated employees retained?

\_\_\_ \_\_\_ \_\_\_ Years (If "forever", code "999")  
(If "unknown", code "998")

#### Intent

To determine the length of time records on terminated employees are kept by the company.

#### NOTE

MSHA has no requirement for the retention of personnel records on terminated employees.

#### Inclusions

Include all recordkeeping systems which identify an individual and provide personal data about that individual.

#### Exclusions

Exclude recordkeeping systems that only identify a group of people collectively. Exclude medical recordkeeping systems.

#### Question

39. Do you keep employee absenteeism records?

- 1 Yes, showing specific nature of illness where appropriate
- 2 Yes, showing only the type of absence
- 3 Yes, without showing the type of absence
- 4 No

#### Intent

To determine if the facility's management keeps any absenteeism records and, if they do, at what level of detail.

#### Definitions

**Employee absenteeism records** refers to that information kept by management concerning the failure of employees to report to work when scheduled.

#### Exclusions

Do not include those records required to be kept by OSHA, MSHA, or State regulations.

#### Procedures

Ask the management representative the question, "Do you keep employee absenteeism records?" If the response given is not adequate to determine the proper code, additional questioning will be necessary.

## APPENDIX C (CONT.)

For example, the response may simply be "yes". In this case ask, "Do these records show the specific nature of sickness?" If answered "yes", code a "1"; if not, ask, "Do these records show the nature of the absence?" If answered "yes", then code a "2". If answered "no", the proper code will be "3".

If the legal requirements are unknown, then circle 1 through 4 as appropriate.

### Question

40. What is your rate of unscheduled absenteeism?

\_\_ \_\_ \_\_ days per employee per year (If unknown, code "998")

### Intent

To determine the absenteeism rate for the establishment due to illness or injury. This number will later be compared to various other facility information to see where correlation might exist.

### Definitions

**Unscheduled absenteeism** is defined as the failure of employees to report to work when scheduled.

**Rate** is defined as the number of days per year per employee.

### Inclusions

Include only those days where the absence is due to illness, injury, or failure to report to work.

### Exclusions

Do not include those days where the absence is due to vacation, jury duty, pre-arranged personal leave, maternity leave, strikes, layoffs, work cancelled due to the weather, etc. If the only rate known by the company includes any of these items enter the response "998".

### Procedures

Where the interviewee says he does not know the absenteeism rate, the interviewer should ask if the information is available from another individual or from the facility's personnel records. If the information is available from these sources, the interviewer should request that the information be obtained. Round answers up to the nearest whole number. For example, if the response is given as being from 4.5 to 5.4 days per year, the response should be coded "5". Where an employer provides a percentage rate, multiply that percentage by "240" work-days to determine the days per year per employee. If the absentee rate is not known, enter the code "998".

## APPENDIX C (CONT.)

### Question

41. What is your turnover rate among permanent employees in the non-administrative areas?

\_\_\_ \_\_\_ % per year

### Intent

To determine an overall turnover rate for employees engaged in non-administrative jobs.

### Definitions

**Permanent employees** are employees expected to be retained on a long-term basis (more than 1 year).

**Non-administrative** is defined as those jobs and positions which are directly engaged in the production, packaging, inspection, and shipping departments of the company. Do not include outside salespersons in this figure.

### Inclusions

Include any permanent employee who is not an executive or a manager who works directly in the production, packaging, and shipping/receiving areas of the facility at least 50% of their work day.

### Exclusions

Exclude temporary and seasonal employees from this calculation. Also exclude all executives and managers who do not work directly in the production, packaging, or shipping/receiving areas of the facility for at least 50% of their work day.

### Procedures

The most recent 12 month data should be used.

### Question

42. What year was your personnel record system begun?

Year system begun \_\_\_ \_\_\_ \_\_\_ (If "unknown", code "998")

### Intent

To determine the year when personnel related data was first collected at this facility. This information will be used in planning epidemiology studies.

### Definitions

Personnel record system is as defined in Question 38.

### Procedures

Enter the earliest year for which systematic information was gathered and is now held for all employees.

## APPENDIX C (CONT.)

### Question

43. Which of the following items are contained in that system?

- 1 Social security number
- 2 Date of birth
- 3 Date(s) of employment with this facility
- 4 Jobs held at this facility
- 5 Employment history at other facilities
- 6 Sex of worker
- 7 Worker's race
- 8 Worker's home address

### Intent

To determine what specific personnel-related data is contained within the personnel record system. This information will be used in planning epidemiology studies.

### Definitions

**Personnel record system** is as defined in questions 38.

### Inclusions

Include items from all previous personnel systems that are still maintained and available for future research.

### Procedures

Circle the numbers corresponding to those items contained in the personnel record system.

### Question

44. Who is in the best position to provide information on the amount of each chemical or trade name substance used at this facility per year? Will this person(s) be available later today or tomorrow?

The inventory contact person(s) is:

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## APPENDIX C (CONT.)

### Intent

To determine the name and concentration of any minerals known to occur in the material being mined. This information will be used by NIOSH chemists during the analysis of the bulk settled dust samples.

### Procedures

Round up all numbers to the next higher whole value. For example 0.01 would be 1 and 98.99 would be 99.

### Question

46. If your mine uses diesel equipment in an underground location, when were the first diesel units brought into the mine?

- 1 We use no diesels in the underground locations of this mine.
- 2 We use diesels in underground locations of this mine, and the first diesel was brought into the mine during \_\_\_\_ \_ .

(If "unknown" code "998")

### Intent

To determine the year when the first diesels were brought into the mine.

### Procedures

If there are no underground locations at the mine, code "1."

If in the past, diesel equipment was used, but is currently no longer used, also code "1."

### Question

47. Does this facility have any equipment that uses PCB-containing fluids?

- 1 Yes
- 2 No
- 3 Unknown

### Intent

To determine the prevalence of equipment using PCB-containing fluids in the mining industry.

### Inclusions

Specific equipment using PCB-containing fluids in the mining industry are transformers, Joy Miner Models CU43 and 9CM, Joy Loader Models 14 and BU 10, and electrical capacitors.

## APPENDIX C (CONT.)

### Procedure

Unknown should be coded only as a last resort, after the surveyor has made several attempts to obtain a yes or no answer from management.

If a power company owned PCB-containing transformer is located on mine property and this information comes to the surveyors attention from any source (mine management, personal observation, power company representative, union representative, or any other source), then the surveyor should answer this question with a "yes". Any PCB-containing equipment that is owned by an outside firm should be coded as a "yes", regardless of who maintains it.

### Question

48. Does this facility rotate shifts, and if so how often?

- 1 Yes, this facility rotates shifts on a \_\_\_\_\_ basis.
- 2 No, this facility does not use shift rotation.

### Intent

To determine the prevalence and frequency of shift rotation in the mining industries.

### Procedures

Circle the number "1" and code a time period in the blank if the facility rotates shifts. For example, if the facility rotates shifts anywhere on a 30 day basis, then circle "1" and code "30 day" in the blank space.

### Question

49. Does this facility have a Labor-Management Health Committee?

- 1 Yes, we have a Labor-Management Health Committee.
- 2 No, we do not have a Labor-Management Health Committee.

### Intent

To assist in determining the relationship between labor-management health committees and the existence of health services.

### Definitions

**Labor-Management** means a formal committee composed of worker and management representatives.

**Formal** means both labor and management recognize the existence and function of the committee.

### Procedures

Circle the appropriate code (1 or 2).

## APPENDIX C (CONT.)

### Question

50. Could you provide me with a geologic description of the strata (or rock formation) in which this mine operates?

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### Intent

To describe the geologic formation in which the mine operates. To assess the utility of other sources of geologic formation information.

### Procedures

Enter key words from the response so as to describe the geologic formation.

### Question

51. If you have an assay laboratory, or if you have access to assay reports, then may I have as an example a copy of each unique type of assay report?

- 1 Yes, we have an assay laboratory at this facility, but you may not have a copy of an assay report.
- 2 Yes, we have an assay laboratory at this facility, and you may have a copy of an assay report.
- 3 Yes, you may have a copy of each type of assay report, but we have no assay laboratory at this facility. Our reports come from an off-facility laboratory.
- 4 No, we have no assay laboratory at this facility.

### Intent

To assist the NIOSH laboratory in analyzing settled dust samples obtained during the walk-through survey.

### Procedure

If a copy of the assay report is not available on-site, then do not attempt to obtain a copy from some off-site facility.

## APPENDIX D

### PRODUCT USE TERMS (PUTs)

There were two types of product use terms (PUTs) which were coded during the NOHSM survey: A PUT for each inventoried item which described the mining facility's primary use of that item; and a PUT for each potential exposure that described how the product was used at that particular worksite where the potential exposure occurred.

Abrasion Resistant Material	Agent, Defoamer
Abrasive, Belt	Agent, Dehydrating
Abrasive, Blasting	Agent, Delimiting
Abrasive, Block	Agent, Descumming
Abrasive, Carrier	Agent, Desensitizing
Abrasive, Cupstone	Agent, Dissolving
Abrasive, Disk	Agent, Extraction
Abrasive, Grinding	Agent, Filter Binding
Abrasive, NEC	Agent, Fixing NEC
Abrasive, Shot	Agent, Foaming
Absorbent	Agent, Leaching
Accelerator	Agent, Leavening
Acid, Battery	Agent, Neutralizing
Acid, NEC	Agent, Oxidizing
Acid, Organic	Agent, Reducing
Acoustical, Plaster	Agent, Releasing
Acoustical, Spray	Agent, Shrinking
Activator	Agent, Solder Reflow
Additive, Chemical Process	Agent, Staining
Additive, Concrete	Agent, Sterilizing
Additive, Cooling Rust Inhibitor	Agent, Tanning
Additive, Cooling System	Agent, Tinting
Additive, Flux	Agent, Vulcanizing
Additive, Fuel	Agent, Waterproofing
Additive, Ink	Agent, Wetting
Additive, Laundry	Aggregate
Additive, Motor Oil	Aid, Filter
Additive, NEC	Alcohol, NEC
Additive, Oil	Alcohol, Denatured
Additive, Paint	Algicide, NEC
Additive, Septic Tank	Alloy, NEC
Additive, Soil	Analytical Nitrate, NEC
Adhesive	Analyzer, Gas
Adjuster, PH	Analyzer, Oxygen
Agent, Anti-Bacterial	Antibiotic, NEC
Agent, Anti-Caking	Antifreeze, Air Brake
Agent, Anti-Foaming	Antifreeze, Airline
Agent, Anti-Fogging	Antifreeze, Automotive
Agent, Anti-Scaling	Antifreeze, Compressor
Agent, Anti-Splattering	Antifreeze, Gasoline
Agent, Anti-Static	Antifreeze, NEC
Agent, Anti-Sticking	Antifreeze, Radiator
Agent, Blasting	Antifreeze, Windshield
Agent, Bleaching	Antioxidant, NEC
Agent, Bluing	Antiprecipitant, NEC
Agent, Chelating	Antiseptic, NEC
Agent, Chemical Fixing	Asbestos
Agent, Coloring	Asphalt
Agent, Curing	Astringent
Agent, Dechlorinating	Bandage

## APPENDIX D (CONT.)

Base	Cleaner, Electrical Contact
Belt Dressing	Cleaner, Engine
Binder	Cleaner, Fabric
Brakes, Equipment	Cleaner, Filter
Braze, Brd	Cleaner, Floor
Braze, Bri	Cleaner, Fuel
Braze, Brt	Cleaner, General
Braze, NEC	Cleaner, Glass
Brazing Rod	Cleaner, Hand
Brick	Cleaner, Masonry
Brightener	Cleaner, Metal
Brush, Carbon	Cleaner, NEC
Brush, Wire	Cleaner, Oven
Buffer	Cleaner, Phalanges
Cable Preparation Kit	Cleaner, Plastic
Cable Splice	Cleaner, Pvc Pipe
Calibrating Solution	Cleaner, Radiator
Calibration Gas	Cleaner, Respirator
Carbons, Lighting	Cleaner, Rock
Carrier	Cleaner, Rubber
Catalyst	Cleaner, Shower
Cement, Alumina	Cleaner, Tile
Cement, Belt Splicing	Cleaner, Tire
Cement, Contact	Cleaner, Type
Cement, Insulating	Cleaner, Upholstery
Cement, Masonry	Cleaner, Window
Cement, NEC	Cleaner, Wood
Cement, Pipe	Clutch Lining
Cement, Pipe Thread	Clutch Pad, Automotive
Cement, Plastic	Coagulant
Cement, Portland	Coating, Abrasion Resistant
Cement, Pvc	Coating, NEC
Cement, Rubber	Coating, Protective
Cement, Splicing	Coating, Roof
Cement, Topping	Collector
Ceramic, NEC	Commutator Stone
Chalk	Compound, Anti-Offset And Smooth Lay
Chemical, NEC	Compound, Anti-Scaling
Clay, Colloidal	Compound, Anti-Seize
Clay, NEC	Compound, Anti-Skid
Cleaner, Abrasive	Compound, Anti-Wear
Cleaner, Acid	Compound, Backing
Cleaner, Acidic	Compound, Balancing
Cleaner, Alkaline	Compound, Belt Splicing
Cleaner, Automotive	Compound, Boiler Water Treatment
Cleaner, Basic	Compound, Bonding
Cleaner, Battery	Compound, Buffing
Cleaner, Bowl	Compound, Capping
Cleaner, Brake	Compound, Caulking
Cleaner, Carburetor	Compound, Chocking
Cleaner, Carpet	Compound, Drawing
Cleaner, Caustic	Compound, Dust Control
Cleaner, Chlorinated	Compound, Etching
Cleaner, Contact	Compound, Expansion
Cleaner, Cooling System	Compound, Finishing
Cleaner, Drain	Compound, Galvanizing

## APPENDIX D (CONT.)

Compound, Gasket  
Compound, Gear  
Compound, Glazing  
Compound, Grinding  
Compound, Heat Shield  
Compound, Heat Sink  
Compound, Heat Transfer  
Compound, Joint  
Compound, Lapping  
Compound, Lining  
Compound, Masking  
Compound, Molding  
Compound, Mounting  
Compound, NEC  
Compound, Packing  
Compound, Patching  
Compound, Pipe Joint  
Compound, Pipe Thread  
Compound, Plating NEC  
Compound, Polishing  
Compound, Potting  
Compound, Radiator Leak Stopping  
Compound, Retaining  
Compound, Rubbing  
Compound, Shielding  
Compound, Sizing  
Compound, Steam Cleaning  
Compound, Stripping  
Compound, Sweeping  
Compound, Tempering  
Compound, Tinning  
Compound, Tire Mounting  
Compound, Troweling  
Compound, Wallboard  
Compound, Water Treatment  
Compound, Wire Pulling  
Compressed Gas  
Conditioner, Air Brake  
Conditioner, GC-Column  
Conditioner, Ink  
Conditioner, Leather  
Conditioner, Metal  
Conditioner, NEC  
Conditioner, Paint  
Conductor  
Construction Material  
Coolant  
Crayon  
Cream, Barrier  
Cream, Electrode  
Cream, Skin  
Cutting Rod  
Cutting Wheel  
Cyanide Antidote  
Deemulsifier  
Deicer  
Delay  
Deodorant  
Depressant  
Descaler  
Desiccant  
Detector Tube  
Detergent  
Developer, NEC  
Developer, Starter  
Disc, Brake  
Disc, Cutting  
Disc, Fiber Cutting  
Disc, Flapper  
Disinfectant  
Dispersant  
Dope  
Drier, Ink  
Drier, NEC  
Drier, Paint  
Dry Fluid Coupler  
Duster  
Dye, Azoic  
Dye, NEC  
Electrode Filling Solution  
Electrolyte  
Emulsifier  
Equalizer, NEC  
Eradicator  
Explosive, Boosters  
Explosive, Connector  
Explosive, Detonator Cord  
Explosive, Detonator NEC  
Explosive, Igniter Cord  
Explosive, Lead Lines  
Explosive, NEC  
Extender  
Extender, Pigment  
Eyewash  
Fertilizer  
Fiberglass  
Fiberglass Fabric  
Fiberglass Repair Kit  
Filler, NEC  
Filler, Shock Absorber  
Filter Media  
Fire Extinguisher  
Fire Retardant  
Fixative, Photographic  
Flint  
Flocculant  
Floor Patch  
Floor Seal  
Flow Enhancer  
Fluid, Automotive Power Steering  
Fluid, Battery  
Fluid, Brake

## APPENDIX D (CONT.)

Fluid, Copy Machine  
Fluid, Correction  
Fluid, Corrosion  
Fluid, Cutting  
Fluid, Drilling  
Fluid, Duplicator  
Fluid, Grinding  
Fluid, Hydraulic  
Fluid, Layout  
Fluid, Manometer  
Fluid, Starting NEC  
Fluid, Steering  
Fluid, Tapping  
Fluid, Tinning  
Fluid, Torque  
Fluid, Transformer  
Fluid, Transmission  
Flux, Brazing  
Flux, NEC  
Flux, Soldering  
Flux, Tinning  
Flux, Welding  
Fragrance  
Freon  
Freshener, Air  
Frother  
Fuel  
Fumigant  
Fungicide  
Furniture Polish  
Fuse  
Gasket, Liquid  
Gasket Material  
Gear Dressing  
Gel, NEC  
Gelatin  
Germicide  
Glass, Borosilicate  
Glass, NEC  
Gloves, Asbestos  
Gouging Electrode  
Gouging Rod  
Graphite  
Gravel  
Grease  
Grout  
Gum  
Hardener  
Heat Treating Chemical  
Herbicide  
Honing Stone  
Horn, Air  
Hydraulic Hoses  
Igniter  
Indicator  
Inhibitor  
Ink, Copying  
Ink, Drawing  
Ink, Instrument  
Ink, Lithographic  
Ink, Marking  
Ink, Metal Marking  
Ink, NEC  
Ink, Printing  
Ink, Recorder  
Ink, Screen Process  
Ink, Stamping  
Ink, Stencil  
Ink, Writing  
Insulation  
Kerosene  
Lab Gas  
Lacquer  
Latex  
Laxative  
Lighter  
Limestone  
Liniment  
Lining, Rubber  
Lotion, NEC  
Lubricant, Cable  
Lubricant, Drill Steel  
Lubricant, Gear  
Lubricant, Molybdenum Based  
Lubricant, NEC  
Lubricant, Open Gear  
Lubricant, Silicone  
Lubricant, Wire Pulling  
Marker  
Mastic  
Metal  
Metal Shrinking Gas  
Moisture Barrier  
Moisture Displacer  
Moisturizer  
Mold Cover  
Mold Release  
Mulch  
Nutrient Media  
Oil, 2-Cycle Motor  
Oil, Air Tool  
Oil, Animal  
Oil, Compressor  
Oil, Creosote  
Oil, Crusher  
Oil, Cutting  
Oil, Cylinder  
Oil, Drill  
Oil, Electric Machine  
Oil, Fuel  
Oil, Gauge  
Oil, Gear

## APPENDIX D (CONT.)

Oil, Generator	Powder, Talcum
Oil, Honing	Powder, Tracing Cloth
Oil, Hydraulic	Precipitant
Oil, Insulating	Preservative
Oil, Linseed	Primacord
Oil, Lube	Primer
Oil, Machine	Promoter
Oil, Mineral	Propellant, Aerosol
Oil, Motor	Propellant, NEC
Oil, NEC	Protectant
Oil, Penetrating	Pumice
Oil, Pine	Putty
Oil, Pneumatic	Radioactive Isotope
Oil, Pump	Raw Material
Oil, Quenching	Reagent, Analytical NEC
Oil, Rock Drill	Reagent, Biological
Oil, Spindle	Reagent, Control
Oil, Tapping	Reagent, Flotation
Oil, Transformer	Reagent, NEC
Oil, Tung	Reagent, Pre-Mixed
Oil, Turbine	Reagent, Titration
Ointment	Reducer, NEC
Oxygen Scavenger	Reducer, Paint
Packing Stick	Refractory Material
Paint	Refrigerant
Patching Material	Remover, Film
Patching Spray	Remover, Flux
Penetrant	Remover, Gasket
Preservative	Remover, Grease
Pesticide	Remover, Ink
Petroleum Jelly	Remover, Moisture
PH Control	Remover, NEC
PH Regulator	Remover, Paint
Photographic Chemical, NEC	Remover, Rosin
Photographic Developer	Remover, Rust
Photographic Fixer	Remover, Scale
Photometer Standard	Remover, Scratch
Pigment	Remover, Spot
PIP (Product "Produced in Plant")	Remover, Stain
Pipe	Remover, Tar
Plasma Arc Cutting Gas	Repellant, Animal
Plaster	Repellent, Insect
Plastic	Repellent, NEC
Plastic Body Filler	Resin
Plastic, Shrink Wrap	Retarder
Plasticizer	Rubber
Plating Solution	Rust Preventative
Polish	Salt
Polish, Rock	Sample
Polishing Stone	Sand
Polishing Wheel	Sand Paper
Polymer	Sand, Silica Free
Porcelain	Sanitizer
Powder, Body	Sealant
Power, Conductive	Sensitizer, NEC
Powder, Cutting	Sharpening, Stone

## APPENDIX D (CONT.)

Shellac	Treatment, Dust Mop
Shielding Gas	Treatment, Metal Surface
Shock Absorber Gas	Treatment, Steam Line Chemical
Sieve, Molecular	Treatment, Water Pump
Silica Gel	Treatment, Wood Surface
Soapstone	Turpentine
Softener	Unknown
Soldering Paste	Varnish
Soldering Rod	Vehicle, Pigment
Solvent	Vehicle, Rubber
Spackle	Water Detector
Stabilizer	Water Softener
Stain	Waterproofing Agent
Standard	Wax, Floor
Starch	Wax, Paraffin
Stimulant	Weld Cloth
Stripping Solution	Welding, NEC
Surfactant	Welding, Powder
Tallow	Welding Rod
Thickener	Welding, Wire
Thinner	Wire
Tire Weight	Wire Cable
Toner, NEC	Wire Wheel
Toner, Photographic	Wood
Traction Material	Wood Filler
Treatment Boiler Water Chemical	Wood Preservative

**APPENDIX E  
DEFINITIONS, GUIDELINES, AND PROCEDURES FOR CODING  
PHYSICAL AGENT POTENTIAL EXPOSURES**

This appendix contains the definitions, guidelines, and procedures which the NOHSM surveyor followed for coding physical agent potential exposures.

**Definitions**

Physical agent potential exposures are defined as noisy, or hot, conditions, as exposure to vibration, or various types of radiation, or magnetic fields, or as exposure to sudden changes in air pressure.

**Procedure**

Potential exposures to physical agents will be identified by the surveyor by observing the worker performing various operations, by questioning the worker about the different operations the worker performs, and by questioning labor and management representatives.

Physical agents pose some difficulty to the NOHSM surveyor in that they usually cannot be identified by means of a label or trade name. The following physical agents will be subject to coding in NOHSM as potential exposures:

Physical Agent	Variation	Code
Temperature	Temperature (process related)	TP
	Temperature (underground strata)	TU
Vibration	Segmental body vibration	SV
	Whole body vibration	WV
Noise		NL
Electromagnetic Radiation	Laser	LS
	Ionizing radiation	IN
	Microwave	MW
	Ultraviolet	UV
	Other	OT

Guidance for each of those physical agents follows:

**1. Temperature**

The NOHSM will not attempt to document temperature extremes due only to natural climate. All other sources of temperature extremes will be documented. The sources to be documented by NOHSM will be process-related or will result from heat-bearing underground rock strata. Exposure to industrial processes which create heat exposure will be common; however, hot conditions resulting from underground rock strata will be relatively rare.

**a. Temperature-Process Related (TP):**

In any mining site surveyed during NOHSM, where an industrial process creates a temperature extreme to an employee work group, this potential exposure should be recorded. Examples of equipment and processes around which this exposure will potentially occur include various types of kilns and dry-

ing ovens, calcining operations, mineral roasting, sintering, and evaporating processes. Surveyors should use their judgement in observing processes, as well as inquiries of workers, in determining whether potential exposure to a temperature extreme should be recorded. The surveyor should be alert for processes which are genuinely uncomfortable to be near for more than a few minutes. In addition, the surveyor should question workers in the vicinity as to whether their job is perceived as "hot". Keep in mind that the temperature extreme is meant to indicate a relatively uncomfortable operation, not just "warm to the touch". For those cases in which a process contributes to the temperature extreme along with the natural climate, the NOHSM surveyor should record a process-related exposure.

**b. Temperature-Underground Strata (TU)**

In carrying out NOHSM, an occasional underground

## APPENDIX E (CONT.)

mine will be surveyed which is characterized by strata which creates a hot working environment. Where such a mine or condition is encountered by a surveyor, potential exposure to this type of heat exposure should be recorded. Mine management and workers should be questioned to identify underground mine areas which are naturally hot and to identify exposed workers.

When the NOHSM surveyor is in doubt as to whether a potential exposure to a temperature extreme should be recorded, the workers' response to inquiries should be followed.

In all cases where a temperature extreme has been recorded the surveyor must determine whether the exposure is full- or part-time and whether any controls are intended. Controls to temperature extremes include rest periods, drinking water, special clothing, fans, air cooling or heating, humidity controls, and shielding equipment for radiant heat.

All entries of temperature extreme must be followed by a note (NTE) statement describing the source of the temperature extreme. The description should include type of equipment, any temperature or humidity data readily available, and further description of controls.

### 2. Vibration

Potential exposures to vibrations will be found in most mines. NOHSM entries will be made in two categories; segmental and whole-body vibration. For both of these categories, vibration is controlled by means of isolation; i.e., padding or vibration damping. The decision to record a potential exposure to vibration is to be based on surveyor observation and questions asked of the workers. A typical question would be "*Does that equipment vibrate?*" The degree of vibration need be only enough to feel it. If possible, the surveyor should experience the vibration prior to coding. Some equipment can be assumed to transmit vibration (even though controls are present). Again, part- or full-time duration must be recorded for each potential vibration exposure.

#### a. Whole-body Vibration (WV)

Any worker who is riding, resting on, or leaning up against motorized or air-powered equipment while performing normal work responsibilities shall be recorded as potentially exposed, assuming there is a vibration transmitted to the worker. Examples of equipment associated with this exposure include trucks, haulage cars, continuous miners, and some

crushing and grinding equipment. In each case, some aspect of the equipment operation must cause the miner's entire body to vibrate.

#### b. Segmental Vibration (SV)

This agent is similar to whole-body vibration but involves only a portion of the miner's body. Hand-held equipment is a common source of segmental vibration; this includes air impact devices such as wrenches, jack-hammers, and drills.

### 3. Noise (NL)

Noise is one of the most widespread physical agents found in the mining industry. The NOHSM surveyor should code a potential exposure to noise (NL) whenever the surveyor must raise his/her voice above a normal conversational level to be heard by the person standing next to him/her. The surveyor must also determine the duration category (full-time or part-time); if the duration is less than the part-time criteria, no potential exposure to noise should be recorded. The usual criteria for full- and part-time potential exposures are to be applied. Controls likely to be found include ear muffs, ear plugs, isolation, break periods, or other administrative controls.

### 4. Electromagnetic Radiation

Potential exposures to electromagnetic radiation will be encountered in many mines. The determination to record the potential exposure will be based on the surveyor's observation of equipment or previous knowledge of the mine's environment. In all cases, the source of the radiation should be described in a note (NTE) statement.

#### a. Ionizing Radiation (IN)

Ionizing radiation includes alpha particles, beta particles, and neutrons, as well as x-rays and gamma rays. Mining operations will most often include alpha particles (associated with radon daughters) and gamma radiation emanating from ore. The surveyor will, where possible, be notified prior to the survey of any previously documented naturally occurring radiation in a mine. Other ionizing radiation may come from a source in equipment used to maintain control over a process; i.e., flow rate, density, or thickness monitoring. In this regard the surveyor should always be alert for radiation warning labels. Controls for the exposure category include shielding, enclosure, distance, limitation on time of exposure, respiratory protection, and ventilation (for radon daughters).

## APPENDIX E (CONT.)

### b. Ultraviolet Radiation (UV)

Ultraviolet radiation from sunlight and common lighting fixtures will not be recorded as a potential exposure in NOHSM. The most common source of ultraviolet radiation to be recorded in NOHSM is that emanating from welding operations. The sources will be identified through survey or observation. Recordable controls are proper clothing, eye protection, and other shielding techniques.

### c. Microwave Radiation (MW)

Microwave sources are not widely employed in mining operations. The most common source is probably the microwave oven used in some lunchrooms, but those are not covered by NOHSM. Microwave sources to be noted will most likely involve product drying or heating operations or procedures. Controls for microwave radiation will almost always consist of shielding. In all cases, the surveyor should be certain of the full- or part-time nature of any recordable potential exposure.

### d. Lasers (LS)

Laser beams may be characterized by wavelength, power, pulse frequency, and beam divergence. Lasers have limited use in mining operations. Laser beams are employed in some surveying equipment used in mines. The surveyor should consider all employees working with the laser-generating equipment as potentially exposed, if the duration guidelines are met. Laser applications in mining will probably not require extensive controls; shielding is the most likely control to be encountered.

### e. Other (OT)

This exposure category should be used for coding potential exposure to electromagnetic radiation, other than those forms for which a specific code has been assigned. Examples of agents which may be classified in this category include infrared radiation (wave length extending from visible light to microwaves—used primarily in heating, drying, and dehydrating applications—heating metal parts, dehydrating milled products, drying paint, and coating, etc.), long wave radio frequencies (used in high frequency electrical heating equipment, gluing, soldering, brazing, thermo-sealing, etc.), masers (predecessor of the laser—emits microwaves instead of light—used in machining and cutting of metals and in some welding operations), or magnetic fields (created and associated primarily with electric current in transformer and transmitter circuits). Again, as with other potential physical agent exposures, it is the responsibility of the surveyor to use questioning and observation to identify locations and/or situations where workers are associated with forms of electromagnetic radiation that would fall within this category. Exposure conditions that are noted in the category should be coded by listing the mnemonic code of OT in columns 37 and 38 of the Part II form, followed by a dash (-) and the type of electromagnetic source identified (i.e. OT-INFRARED RADIATION). In addition, as previously mentioned, a NTE statement must be used to further classify and identify the potential exposure condition noted.

## **APPENDIX F**

### **DEFINITIONS, GUIDELINES, AND PROCEDURES FOR CODING MUSCULOSKELETAL OVERLOAD POTENTIAL EXPOSURES**

This appendix contains the definitions, guidelines, and procedures which the NOHSM surveyor followed for coding musculoskeletal overload potential exposures.

#### **Definition**

Musculoskeletal overload potential exposures are defined as (a) repetitive motions with a body part, or (b) as a static position for a long period of time, or (c) as tasks that require constant long term attention, or (d) in diminished light.

#### **Procedure**

Potential exposures to musculoskeletal overload conditions will be identified by the surveyor by observing the worker perform various operations, by questioning the worker about the different operations the worker performs, and by questioning labor and management representatives.

Many musculoskeletal injuries appear to arise not so much from a single accident as from repeated overloads that are not obviously hazardous. These disorders can be thought of as "*wear and tear*" injuries. For example, repetitive pounding with a hammer can cause a chronically sore forearm and elbow (from tendinitis, for example). Low back pain is more common among workers who repeatedly lift heavy loads. Another example is inflammation of the knee that may develop in a worker who spends several hours each day kneeling.

Unfortunately, it is frequently difficult to associate a specific activity with a specific disorder. Therefore, the surveyor will be asked to identify patterns of activity that appear to represent a stress or an overload to the musculoskeletal system. It is the repetition or continuation of overloads, not the severity of a single activity, that produces the "*wear and tear*" disorders.

Twelve basic categories of activities are used in the survey. It should be emphasized that these are overloads and in many individuals will never result in identifiable illness. However, the surveyor will code these overloads, much as the surveyor would code potential exposure to each chemical used in the workplace, regardless of the actual level of exposure.

The twelve categories of overloads are listed in this report. They include stressful activities that may apply to five anatomical regions, three sorts of lifting, three postures, and diminished light. Although diminished light is not a musculoskeletal overload, it is included because it can make work more fatiguing and hazardous.

For each job title within the mine, the surveyor will be asked to record each overload condition the surveyor observes, the number of workers that are affected, and whether the exposure is part-time or full-time. The identification of musculoskeletal overloads involves the following:

- a) surveillance of the **workers activities** in contrast to surveying their environment,
- b) the observation of **repetitive** activities that appear to occur on a continuous basis,
- c) questioning workers on the **amount of time** spent performing the activity during an average workday.

Unlike chemical exposures, there are no labels or trade names to help the surveyor. Observe workers with each job title long enough to get an idea of the motions involved. If the work is repetitious, such as loading a shuttle car, observe at least two full cycles. Analyze the job for each of the twelve overloads. Observe the positions the worker assumes, and estimate the forces involved. Try to determine if the load is appropriate to the strength and position of the structures bearing it. If it is difficult to estimate the force involved, ask the worker if he is pushing hard, how much the object he is carrying weighs, or whether the activity makes his muscles sore.

If more than one code could be used to describe the same activity, use only the more specific code. For example, if a miner is lifting while twisting, this is coded as awkward lifting, even though it might also be

## APPENDIX F (CONT.)

coded as neck and back. If, however, two aspects of a job are overloads, both codes should be recorded. For example, if a miner is lifting 60 pounds, 7 times a minute, both heavy lifting and frequent lifting would be coded.

After the surveyor has determined which, if any, overloads are involved, ask the worker how much time he spends each day at this particular activity, and record whether the exposure is part-time (30 minutes to four hours per day) or full-time (more than four hours per day).

Since the surveyor's observations will be applied to all workers with a particular job title, even those on other shifts, it is essential that the surveyor observe every miner at the work site on the shift that is being surveyed. If a given job title is not represented on the shift being surveyed, and if a knowledgeable person who has had extensive work experience in that job title cannot be questioned, then the surveyor will have to survey that job title on the shift when at least one worker in the job title is available. Try to obtain a representative sample, including several miners within each job title. For example, if both advance and retreat mining are going on in one mine, observe crews that are carrying out each process.

The accuracy of the data are entirely dependent upon the surveyors' understanding of the overloads, the surveyors' powers of observation, and the surveyors' ability to faithfully record these observations within the coding system. Definitions, examples, and a hypothetical set of observations are provided for the surveyor to use in familiarizing himself/herself with the survey strategy.

### MUSCULOSKELETAL OVERLOAD CODES

#### 1. FINGERS AND HANDS CODE= FH

- a. Forceful finger actions (except grasping with the whole hand)
- b. Grasping with wet or poorly-fitting gloves
- c. Tool handles that end in the central part of the palm

Example: Tightening a nut with unaided fingers

#### 2. WRIST CODE= WR

- a. Forceful movements or finger manipulations with the wrist bent
- b. Repeated wrist motion
- c. Clothes-wringing motion

Example: Pushing a heavy object with a flat hand and the wrist extended

#### 3. FOREARM, ARM, AND SHOULDER CODE= AS

- a. Unsupported abducted elbows
- b. Forearms resting on sharp edges
- c. Tossing motions at extremes of range of motion
- d. Working with hands above the shoulders

Example: Laying block at the top of a high wall, without the use of a ladder

#### 4. NECK AND/OR BACK CODE= NB

- a. Bent forward

## **APPENDIX F (CONT.)**

- b. Bent to the side
- c. Hyperextended
- d. Twisted neck or back

Example: Twisting while seating to monitor operations behind the miner's seat. (Of course, if the miner moves his feet rather than twisting his spine, there is no overload.)

### **5. LOWER LIMB CODE=LO**

- a. Kneeling
- b. Squatting (Bearing the body weight on the knee, flexed to an acute angle)
- c. Crawling on hands and knees

Example: Crawling to the mine face in a low coal seam.

### **6. HEAVY LIFTING CODE=HV**

- a. Lifting greater than 50 pounds, unaided

Example: Unloading 80 pound cement bags from a motor

### **7. FREQUENT LIFTING CODE=FQ**

- a. Lifting greater than 25 pounds, 5 times or more per minute

Example: Lifting cinder blocks onto a scaffolding

### **8. AWKWARD LIFTING CODE=AK**

- a. Lifting above the level of the miner's head
- b. Lifting while twisting
- c. Lifting while reaching excessively

Example: Reaching to the bottom of a 30" deep cart, lifting out objects

### **9. STANDING CODE=SD**

- a. Standing without movement for 4 minutes or more
- b. Standing in a restricted space, without sitting or leaning for two hours or more
- c. Operating pedals while standing

### **10. SITTING CODE=SI**

- a. Sitting in a cramped position
- b. Sitting with knees lower than the hips
- c. Sitting with feet dangling
- d. Sitting without low back support
- e. A seat that is tilted forward or to one side
- f. Using extra pads on seats (indicating that the seat is uncomfortable)

## APPENDIX F (CONT.)

Example: Sitting in a low position in the operation of a continuous miner

### 11. PRONE OR SUPINE LYING CODE=PS

(Any position in which less than half the body weight is borne on the buttocks)

- a. Lying flat on the back
- b. Lying on one side, supported by one hip and one shoulder or elbow
- c. Lying on the abdomen

Example: Various positions on the floor of a very low coal seam

### 12. DIMINISHED LIGHT CODE=DL

- a. Inadequate illumination of the work. This will vary with the size and contrast of the work. In any case, the worker must be able to clearly see the object he is working on.
- b. Inadequate field of illumination. Light that does not cover the entire field of the miner's work.

Example: A miner's lamp provides an adequate intensity of light over a small area, but it does not illuminate the whole area in which the miner is working.

(This code would apply to almost all underground mining, night shifts in surface mines, and poorly lit interior work areas.)

## GENERAL

Code the following conditions under the body parts involved:

- a. Pounding with a body part

Example: Banging with a fist. Code FH

Driving a wedge beneath a post by kicking. Code LO

- b. Static work, that is a continuous muscular contraction without any relaxation for a prolonged period. Effort is expressed as a percentage of the maximal voluntary contraction that can be developed in the specific muscle involved. The specific criteria are:

Near maximal effort (90–100% of maximal) for 10 seconds. Moderate effort (50–89% of maximal) for 1 minute or more. Slight effort (33–49% of maximal) for 4 minutes or more. (Loads that involve small muscles or awkward positions may involve a large percent of maximal effort, even though they involve small absolute forces.)

Example: A mechanic bolting a part into place with his arms outstretched in front of him, without support, for 4 minutes. Code AS.

**APPENDIX F (CONT.)  
SUMMARY OF OVERLOAD CODES**

<b>TITLE AND DESCRIPTION</b>	<b>CODE</b>
<b>FINGER AND HANDS</b>	<b>FH</b>
Forceful finger actions, wet or poorly fitting gloves, sharp tool handles	
<b>WRIST</b>	<b>WR</b>
Forceful movements with wrist bent, repeated wrist motion	
<b>FOREARM, ARM, AND SHOULDER</b>	<b>AS</b>
Abducted elbows, forearms on sharp edges, hands above head	
<b>NECK AND/OR BACK</b>	<b>NB</b>
Bent, twisted, or hyperextended	
<b>LOWER LIMB</b>	<b>LO</b>
Kneeling, squatting, and crawling	
<b>HEAVY LIFTING</b>	<b>HV</b>
Greater than 50 pounds	
<b>FREQUENT LIFTING</b>	<b>FQ</b>
Greater than 25 pounds, five or more times per minute	
<b>AWKWARD LIFTING</b>	<b>AK</b>
Twisting, reaching, or above the head	
<b>STANDING</b>	<b>SD</b>
Standing without support for two hours or while operating pedals	
<b>SITTING</b>	<b>SI</b>
Without low back support, feet dangling, or knees below hips	
<b>PRONE OR SUPINE LYING</b>	<b>PS</b>
On back, side, or abdomen	
<b>DIMINISHED LIGHT</b>	<b>DL</b>
Work not adequately illuminated	
<b>GENERAL</b>	<b>Code by</b>
Pounding or static work	<b>body part</b>

**APPENDIX G  
WELDING, BRAZING, AND SOLDERING POTENTIAL EXPOSURES**

The four elements which were coded in welding, brazing, or soldering operations were: (1) the type of welding, brazing, or soldering processes which were used; (2) the names of the metals which were welded, brazed, or soldered on; (3) the trade names of the welding, brazing, or soldering rods, wires, and/or gases which were used in the processes; and (4) any chemicals or trade name products which were attached to the metal being welded, brazed, or soldered upon; such as solvents that were used to clean the metal prior to welding, brazing, or soldering; or lubricants that were used to lubricate the metal prior to welding, brazing, or soldering. The codes and names of the welding, brazing, and soldering processes that were employed under NOHSM were taken from the National Occupational Exposure Survey (NOES) and are listed as follows:

**WELDING PROCESSES**

**Oxyfuel Welding**

OFWO Oxacetyl Welding  
OFWP Pressure Gas Welding

**Resistance Welding**

REWR Resistance Spot Welding  
REWS Resistance Seam Welding  
REWP Projection Welding  
REWE Electromagnetic Solid-State Welding

**ARC Welding**

ARWS Shield Metal Arc Welding  
ARWM Metal Arc Welding  
ARWC Carbon Arc Welding

**Gas Metal ARC Welding**

MIGP Pulsed Arc Welding  
MIGS Short Circuit Arc Welding  
MIGE Electrogas Welding  
MIGT Spray Transfer Welding  
MIGB Buried Arc Welding

**Gas Tungsten ARC Welding**

TIGS Gas Tungsten Arc Spot Welding

**Other Types of Welding**

FCAW Flux Cored Arc Welding  
SAWA Submerged Arc Welding  
PAWA Plasma Arc Welding  
STWA Stud Welding  
AHWA Atomic Hydrogen Welding  
ESWA Electro-Slag Welding  
PWPA Other Welding Processes

**BRAZING PROCESSES**

BRTO Torch	BRIN Induction
BRFU Furnace	BRRE Resistance
BRDI Dip	

**SOLDERING PROCESSES**

SOEI Electric Irons	SODI Dip
SOTO Torch	SOIN Induction

**CUTTING PROCESSES**

OFCU Oxyfuel Gas Cutting	PACU Plasma Arc Cutting
ARCU Arc Cutting	

**APPENDIX H**  
**NOHSM OCCUPATION, OPERATION, AND LOCATION CODES,**  
**TITLES, AND DEFINITIONS FOR METAL & NON-METAL MINES**

The NOHSM names and definitions of the occupations, operations, and locations were taken directly from the MSHA list of occupations, operations, and locations for metal and non-metal mines.

**METAL/NON-METAL OCCUPATION CODES**

<b>028</b>	<b>Scoop-Tram Operator</b>	<b>035</b>	<b>Continuous Miner Helper</b>
	One who runs a rubber tired loader with a scoop (shovel with a blade to scrape up rock or ore) to pick up, transport, and dump ore or rock not otherwise classified. Although Scoop-Tram is a brand name, this code is used for operation of similar equipment.		One who sets up and provides help to the continuous miner operator.
<b>029</b>	<b>Mucking Machine Operator</b>	<b>036</b>	<b>Continuous Miner Operator</b>
	One who operates a mechanical device which loads broken ore or rock. (Excludes slusher.)		An operator of a continuous miner (a mining machine designed to remove rock from the face without the use of drills or explosives and load it onto conveyors or shuttle cars).
<b>030</b>	<b>Slusher Operator</b>	<b>037</b>	<b>Cutting Machine Helper</b>
	One who operates a cable or wire-drawn scraper to move or load broken rock or ore. Often the rock or ore is dropped through a hole for loading purposes.		One who sets up and provides help to the cutting machine operator.
<b>032</b>	<b>Brattice Man</b>	<b>038</b>	<b>Cutting Machine Operator</b>
	One who builds brattices (ventilation walls or partitions in underground passageways) of wood, canvas, or other flexible material to control proper circulation of air through passageways and to working places.		One who operates an electrically or compressed-air-driven cutting machine which is used to cut out a channel along the bottom or side of the working face so that it may be blasted down.
<b>034</b>	<b>Diamond Drill Operator</b>	<b>039</b>	<b>Hand Loader (Load Only)</b>
	One who sets up and operates a diamond drill that is used to obtain solid cores of strata drilled through so that the character of the ground, the wealth of ore, or strength of material for foundations may be determined. Also called core driller, core-drill operator, diamond-drill runner, diamond-point drill operator, shot-core drill operator, test borer, test-hole driller, or wash driller. Excludes wheel-mounted drills.		One who shovels (by hand) ore or rock in order to load it onto cars, conveyors, etc. Also called a mucker.
		<b>041</b>	<b>Jacksetter</b>
			A person who assists in the operation of a cutting machine, one of whose duties is to see that the roof of the mine at or near the machine is in a reasonably safe condition by setting jacks.
		<b>043</b>	<b>Gathering Arm Loader Operator</b>
			One who operates a machine for loading rock or ore of the following description: It has a tractor-mounted chassis, carrying a chain conveyor the front end of which is built into a wedge-shaped blade. Mounted on this

## APPENDIX H (CONT.)

- blade are two arms, one on either side of the chain conveyor, which gather the rock or ore from the muck pile and feed it onto the loader conveyor. The tail or back end of the conveyor is designed to swivel and elevate so that the material can be loaded into a car or onto a conveyor.
- 045 Hangup Man; Chute Blaster**
- One who keeps ore moving in large chutes in raises (underground openings driven upward from one level to another) when ore being drawn or loaded into cars at a lower level becomes blocked in the chute. May use small explosive charges to dislodge ore.
- 046 Rock Bolter; Roof bolter**
- One who drills and places bolts at the face or in passageways to provide roof support. Bore holes are drilled and bolts are inserted into the holes and anchored at the top by a split cone or similar device. The bolt end protrudes and is used to support roof bars, girders, or simple steel plates pulled tight up to the roof or sides.
- 048 Roof Bolter Mounted**
- One who drills and places roof bolts with a drill mounted on a piece of machinery; for example mounted on a continuous miner. See roof bolter.
- 053 Utility Man**
- A skilled miner capable of filling in for other miners when they are absent.
- 057 Stope Miner**
- Any miner who works in a stope (an underground opening from which ore is extracted in a series of steps). (Not elsewhere classified).
- 058 Drift Miner**
- Any miner who works in a drift (horizontal passageway underground). (Not elsewhere classified).
- 059 Raise Miner**
- Any miner who works in a raise (see raise bore operator). (Not elsewhere classified).
- 079 Crusher Operator; Crusher Worker; Pan-Feeder Operator**
- Includes laborers who regulate the ore or other materials into crushers and/or operates the crusher where the ore is reduced to a relatively coarse size.
- 134 Jet-Piercing Channeler Operator**
- One who operates a device producing a high velocity jet flame to cut channels in hard rock. It involves combustion of oxygen and a fuel oil fed under pressure through a nozzle to produce a jet flame generating a temperature of over 5,000°F. A stream of water may join the flame, and the combined effect is a spalling and disintegration of the rock into fragments which are blown from the cut.
- 154 Belt Cleaner; Belt Picker**
- One who removes material by hand from a conveyor belt.
- 179 Ball, Rod, or Pebble Mill Operator**
- Individuals involved in grinding material, with or without liquid, in a rotating cylinder or conical mill partially filled with grinding media (balls, rods, or pebbles).
- 216 Track Man; Track Gang**
- One employed at mines to lay or repair tracks for rail transportation.
- 234 Jet-Piercing Drill Operator**
- One who operates a device producing a high velocity jet flame to drill holes in hard rock. It involves combustion of oxygen and a fuel oil fed under pressure through a nozzle to produce a jet flame generating a temperature of over 5,000°F. A stream of water may join the flame, and the combined effect is a spalling and

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- disintegration of the rock into fragments which are blown from the hole.
- 261 Battery Station Operator**  
One who is responsible for charging and exchanging batteries used in a mine.
- 279 Hammer Mill Operator**  
One who operates an impact mill which is typically used for size reduction of materials. An impact mill consists of a rotor, fitted with movable hammers, that is revolved rapidly in a vertical plane within a closely fitting steel casing. Also known as disintegrator; whizzer mill; beater mill.
- 331 Clam-Shell Operator**  
One who operates a twin-jawed bucket hung from a boom by a cable in order to pick up, transport, and dump rock or ore. The bucket is dropped in the open position onto the material to be transported. It is then closed, thereby trapping material between the hinged two halves.
- 334 Wagon Drill Operator**  
The operator of a wheel-mounted or track-mounted pneumatic percussive type rock drill or a wheel-mounted diamond drill machine.
- 342 Bit Grinder; Bit Sharpener**  
One who operates a bit grinding machine that shapes and sharpens cutting edges of detachable drilling bits by abrasive action of grinding wheels.
- 344 Car-Shake-Out Operator**  
One who operates a mechanical device to empty material from a car by vibrating or shaking the car.
- 352 Iron Worker; Metal Worker**  
A construction worker employing iron or other metal products.
- 367 Shovel Operator**  
One who operates a mechanical device for excavating and loading consisting of a digging bucket at the end of an arm suspended from a boom which extends from the powerplant of the machine. When digging, the bucket moves forward and upward so that the machine does not excavate below the level on which it stands.
- 368 Bulldozer Operator**  
One who operates a heavy, gasoline or diesel-driven vehicle with tracks having a front-mounted blade for moving earth, rock, or ore.
- 372 Barge Attendant; Boat Operator; Dredge Operator**  
BARGE ATTENDANT—One who works on a barge (water craft for transportation of ore or rock).  
BOAT OPERATOR—One who operates a water craft to provide propulsion for barges.  
DREDGE OPERATOR—One who operates a dredge (machine for mining material from beneath rivers, lakes and streams).
- 375 Road Grader Operator**  
One who operates a machine to level mine roads.
- 376 Truck Driver**  
One who operates a self-propelled (gasoline or diesel) wheeled vehicle which operates on public or private highways to transport material between transfer points.
- 378 Mobile Crane Operator**  
One who operates a crane (machine for lifting and transporting heavy weights) driven by a gasoline, diesel or electric motor which travels on crawler tracks, pneumatic tires, or solid rubber tires and capable of moving in any direction under its own power.

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<p><b>379    Dryer Operator; Kiln Operator</b></p> <p>A person who operates a dryer or kiln (apparatus for drying ores, or finished products; the many types vary in size, shape, and source of heat).</p>	<p><b>399    Dimension Stone Cutter and Polisher; Rock Sawyer</b></p> <p>One who saws or cuts stone to specific dimensions. One who smoothes the surface of stone such as granite or marble.</p>
<p><b>385    Lampman</b></p> <p>A person having responsibility for cleaning, maintaining, and servicing the miner's lamps. Also called lamp cleaner; lamp-house man; lamp keeper; lamp repairer; safety-lamp keeper.</p>	<p><b>413    Janitor</b></p> <p>One who keeps the premises of a mine site clean by removing waste and refuse.</p>
<p><b>387    Rotary Bucket Excavator Operator</b></p> <p>One who operates mobile loading equipment with rotary buckets.</p>	<p><b>416    Salvage Crew</b></p> <p>One who recovers timber, rails, steel arches, pipes, etc. from abandoned workings and prevents wastage in the use of materials.</p>
<p><b>388    Scalper-Screen Operator</b></p> <p>One who operates a coarse primary screen or grizzly which passes ore size of a certain maximum dimension.</p>	<p><b>420    Aerial Tram Operator</b></p> <p>One who runs a system for the transportation of material (ore or rock) in buckets suspended from pulleys or grooved wheels that run on a cable, usually stationary. A moving or traction cable is attached to the buckets and is operated by gravity or other power sources.</p>
<p><b>389    Forklift Operator</b></p> <p>One who operates a power-driven truck having a forward-projecting steel fork used to raise, transport, and stack heavy loads such as bagged material on pallets.</p>	<p><b>434    Churn Drill Operator</b></p> <p>One who drills holes with a churn (cable) drill in rock and in overlying ground of open-pit mines or quarries to obtain samples, or to provide holes in which explosives are charged and set off to break up the solid mass. Also called blast hole driller, blasting hole well driller, clipper blast-drill operator, or well driller operator.</p>
<p><b>392    Toplander; Skip Dumper; Tipple Operator</b></p> <p>One on the surface who receives and unloads vehicles loaded with rock and ore.</p>	<p><b>456    Engineer (Electrical, Ventilation, Mining, Etc.); Technical Services</b></p> <p>One who is skilled in the application of science and mathematics to practical problems involving the properties of matter and sources of energy; or one who assists in such activity. For example an electrical engineer designs and specifies the systems to safely</p>
<p><b>393    Weighman; Scale Man</b></p> <p>One who determines the weight of ore or rock by use of a scale.</p>	
<p><b>394    Carpenter</b></p> <p>One who is skilled in building or repairing wooden structures.</p>	
<p><b>397    Yard Engine Operator</b></p> <p>The operator of a locomotive which moves ore or rock carrying rail cars</p>	

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	transport electricity to mining equipment.		of materials; for example, the feed to a filter press or other filtration equipment).
<b>479</b>	<b>Hydrating Plant Operator</b>	<b>588</b>	<b>Sizing and Washing Operations Worker</b>
	A worker who operates a plant where a mineral is combined with water, forming a hydroxide. An example product is hydrated lime.		A worker who operates equipment that sizes and washes ore by the use of screens and water.
<b>488</b>	<b>Dry Screening Plant Operator</b>	<b>601</b>	<b>Conveyor Belt Crew</b>
	An operator responsible for the screening of solid materials for their separation into categories by size without the aid of water. Not a primary screen or grizzly.		One who sets up and tends conveyor belts used to transport material at a mine. Also called beltman; conveyor beltman.
<b>513</b>	<b>Building Repair and Maintenance</b>	<b>602</b>	<b>Electrician</b>
	One who repairs and maintains the buildings associated with a mine.		A specialist skilled in electricity who maintains electrical equipment in a mine.
<b>514</b>	<b>Laboratory Technician</b>	<b>603</b>	<b>Electrician Helper</b>
	One who assists or completes tests or analysis often of a chemical nature in support of mining activity. May or may not work under the direct supervision of a chemist.		One who assists or aids the electrician.
<b>516</b>	<b>Tamping Machine Operator</b>	<b>604</b>	<b>Mechanic</b>
	A person who operates a machine that compacts base material around rail ties in order to lay or realign track.		One skilled in repairing mining equipment.
<b>534</b>	<b>Jackleg or Stoper Drill Operator</b>	<b>607</b>	<b>Jackhammer Operator; Chipping Hammer Operator</b>
	The operator of a percussive type of automatically rotated rock drill driven by compressed air and used to drill holes in ore or rock for insertion of explosives. This drill has a telescoping leg used to apply pressure to the bit. The jackleg drill has a variable angle thrust while the stoper drill angle is fixed.		<b>JACKHAMMER OPERATOR</b> —One who operates a percussive type of automatically rotated rock drill that is worked by compressed air. Bit pressure is manually applied. <b>CHIPPING HAMMER OPERATOR</b> —One who operates a percussive type rock drill that is worked by compressed air. Bit pressure is manually applied.
<b>579</b>	<b>Slurry, Mixing or Pumping Operations Worker</b>	<b>608</b>	<b>Mason</b>
	A person who prepares and regulates the flow of a slurry (a thin watery suspension		One who is skilled in laying brick, block, and stone. Includes construction of masonry brattice (partitions of rough masonry or cement to control air movement for ventilation purposes). Often supervises the work of cement or concrete workers.
		<b>609</b>	<b>Supply Man; Nipper</b>
			A person who delivers supplies to miners.

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|------------|---|------------|---|
| <b>612</b> | <b>Belt Vulcanizer</b><br><br>One who uses equipment to repair (vulcanize) the belt joints of conveyors. The process involves the use of heat, sulfur, and chemical accelerators to mend damaged conveyor belts.  |            | unloading of ore where ore-carrying cars are emptied. Excludes toplander.   |
| <b>613</b> | <b>Cleanup Man</b><br><br>One who collects and loads spillage resulting from normal operations.   | <b>623</b> | <b>Surveyor; Transit Man</b><br><br>One skilled in the science of making angular and distance measurements necessary to determine the relative position of points on or beneath the surface of the earth or to establish such points. Locates boreholes, shafts, and tunnels in order to document and guide mining activity. A transit is a specific tool employed by a surveyor. |
| <b>614</b> | <b>Sampler; Dust Sampler</b><br><br>One who collects small amounts or samples of ore for laboratory analysis. Also one who collects air samples to determine dust or radon daughter content.  | <b>634</b> | <b>Rotary (Electric or Hydraulic) Drill Operator</b><br><br>A person who operates a drill machine that is electrically or hydraulically powered and rotates a rigid tubular string of rods to which is attached a bit for drilling rock to produce boreholes. No percussion is involved.  |
| <b>616</b> | <b>Laborer; Bullgang</b><br><br>General workers not otherwise classified.   | <b>649</b> | <b>Administrative, Supervisory, Management Personnel</b><br><br>One who superintends, guides, or directs workers at a mine or assists in such activity.   |
| <b>618</b> | <b>Greaser; Oiler</b><br><br>A workman responsible for keeping machinery properly lubricated. Also called grease monkey.  | <b>660</b> | <b>Machinist</b><br><br>One who is skilled in the use of metal working tools.   |
| <b>619</b> | <b>Welder (Welding, Cutting, Brazing, Hard Surfacing, Soldering)</b><br><br>One who completes the following tasks:<br>WELDING—The joining of two metal surfaces which have been heated sufficiently to melt and fuse together.<br>CUTTING—Cutting metal with a high temperature flame.<br>BRAZING—Joining metals by flowing a thin layer of nonferrous filler metal into the space between them. Generally exceeds 800° F.<br>HARD SURFACING—The application of a hard, wear-resistant alloy to the surface of a softer metal by an arc or gas-welding process.<br>SOLDERING—Identical to brazing, except below 800° F. | <b>663</b> | <b>Shaft Miner; Shaft Sinking</b><br><br>One who opens shafts (passageways) from the surface or an intermediate level to lower levels. Also called shaft driller, shaftman, or sinkman. (Not elsewhere classified.)   |
| <b>622</b> | <b>Dump Operator</b><br><br>One who controls the loading of ore or rock at the end of a conveyor or the   | <b>668</b> | <b>Tractor Operator</b><br><br>One who drives a gasoline or diesel-driven machine with tracks or pneumatic tires in order to pull or push other vehicles.   |
| <b>622</b> | <b>Dump Operator</b><br><br>One who controls the loading of ore or rock at the end of a conveyor or the   | <b>669</b> | <b>Bin Puller; Truck Loader</b><br><br>One who transfers material from a storage bin or chute into mobile equipment for transport.  |

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- 673 Leaching Operators Worker**  
A worker involved with extracting a soluble metallic compound from an ore by selectively dissolving it in a suitable solvent, such as water, sulfuric acid, hydrochloric acid, etc.
- 674 Warehouseman; Supply Handler**  
One who is responsible for the receipt, storage, and distribution of equipment, spare parts, and other materials necessary to the operation of the mine.
- 678 Dragline Operator**  
One who operates a large piece of excavating equipment often used for removing overburden at surface mines. It casts a wire rope-hung bucket a considerable distance, collects the dug material by pulling the bucket toward itself on the ground with a second rope, elevates the bucket, turns, and dumps the material.
- 679 Flotation Mill Operator; Concentrator Operator**  
One who operates apparatus in which by the aid of water, air, or chemicals and specific gravity, separation of valuable minerals from waste materials is performed.
- 682 Scraper-Loader Operator**  
One who operates a machine used for loading rock by pulling an open-bottomed scoop back and forth between the face and the loading point by means of ropes, sheaves, and a multiple drum hoist. The filled scoop is pulled on the bottom to an apron or ramp where the load is discharged onto a car or conveyor.
- 706 Shotcrete Man; Gunite Man**  
One who sprays cement mortar (gunite or shotcrete) on timbers, roadways, roofs, and/or ribs of underground mines in order to prevent erosion or weathering by air and moisture.
- 708 Ventilation Crew**  
One who works to install and maintain equipment which provides an adequate flow of fresh air in an underground mine. Excludes brattice man.
- 710 Ground Control (Wood and Steel); Timberman**  
One who frames (cuts end and side notches), fits, and installs sets of timbers (wood and steel) as well as regulating the final closure of the walls of a stoped area underground.
- 716 Cement Man; Concrete Worker**  
One who works with concrete and cement often under the supervision of a mason. Excludes gunite or shotcrete.
- 726 Grizzly Man; Grizzly Tender**  
One who breaks large pieces of rock or ore so they will pass through a grizzly (a rugged screen, bars, disks, tumblers, or rollers used for the sizing of very coarse ore or rock). May employ explosives. Also called draw man; monkey; screen ape.
- 728 Complete Load/Haul/Dump Cycle**  
One who works at any or all places throughout the process of picking up, transporting, and discharging rock or ore.
- 734 Rotary (Pneumatic) Drill Operator**  
A person who operates a drill machine that is pneumatically (compress air) powered and rotates a rigid tubular string of rods to which is attached a bit for drilling rock to produce boreholes. No percussion is involved.
- 739 Hand Trammer (Load and Dump)**  
One who both loads and pushes cars containing rock or ore.

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- 747 Scaling (Hand or Mechanical)**  
One who uses a long bar or machine to pry loose stone from the roof or ribs of the mine.
- 750 Shuttle Car Operator (Diesel)**  
One who operates a diesel-powered truck-like vehicle to move ore or rock between transfer points. It has a self-contained conveyor to assist in loading and unloading.
- 759 Raise Borer Operator**  
One who operates a machine which opens a raise. A raise is any vertical or inclined opening driven upward from one level to connect with the level above, or to explore the ground for a limited distance above one level.
- 763 Shaft Repairer**  
One who inspects shaft timbering, guides, guards, and parts from the top of a slowly moving cage or by climbing down a man-way, replacing and repairing damaged or defective shaft timbers, cage guides and guards, and other parts; and tightening joints of compressed air, steam, and water pipes. Also called shaft mechanic; shaft repairman; shaft tender; sheaveman.
- 765 Backfiller (Dry Operations)**  
One who operates a device which transports waste rock (gob) to fill and support cavities left by the extraction of ore.
- 766 Sandfiller (Wet Operations)**  
One who operates a hydraulic device which transports sand or mine tailings with water to fill and support cavities left by the extraction of ore.
- 778 Backhoe Operator**  
One who operates a relatively small excavating machine often used for trenching.
- 779 Pelletizing Operations Worker**  
The basic action involves extending its bucket forward with its teeth-armed lip pointing downward and then pulling it back toward the source of power.
- 782 Front-End Loader Operator**  
One who operates a tractor loader with a digging bucket mounted at the front end of the tractor.
- 804 Plumber; Pipe Fitter; Millwright**  
**PLUMBER**—One skilled in the installation and repair of piping, fittings, fixtures involved in the distribution of water, steam, or gas in a mine.  
**PIPE FITTER**—See Plumber.  
**MILLWRIGHT**—A worker who specializes in construction or erection of mills and milling machines.
- 807 Powder Gang; Powderman; Powder Monkey; Shooter; Shotfirer, Blaster**  
Personnel in charge of explosives in an operation of any nature requiring their use. Also called powderman, powder monkey, shooter, or shotfirer.
- 825 Bobcat Operator**  
One who runs a miniature front end loader in order to move small amounts of rock or ore often spilled at transfer points. Although Bobcat is a brand name, this code is used for operation of similar equipment.
- 833 Drill Helper; Chuck Tender**  
One who assists the operator of a drill.
- 850 Ramcar Operator**  
One who operates a diesel or electric-powered truck-like vehicle to

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- move ore or rock between transfer points. It has a hydraulic ram for unloading.
- 878 Overhead Crane Operator**
- One who operates a crane which moves in a limited range on overhead rails. (See mobile crane operator).
- 879 Bagging or Packing Operations Worker**
- A worker who fills and/or loads a sack with a finished product in preparation for shipping. The sack may be paper, cloth, canvas, or other material depending upon the product or method of shipment.
- 894 Painter**
- One who is skilled in applying paint and protective coatings to surfaces.
- 920 Cager; Cage Attendant; Station Attendant**
- One who loads and unloads men and material from a cage (elevator); signals hoist operator when to move cage.
- 921 Hoist Operator**
- One who uses a hoist (drum on which cable is wound to raise and lower equipment or material in a shaft).
- 930 Skip Tender**
- One who loads and directs the movement of a skip (hoisting bucket) to transport material between various levels and the surface.
- 934 Jumbo Percussion Drill Operator**
- The operator of a pneumatic drill machine which is used widely in mining for exploration and blasting purposes. A number of drills may be mounted on a mobile carriage.
- 950 Shuttle Car Operator (Electric)**
- One who operates an electrically-powered truck-like vehicle to move ore or rock between transfer points. It has a self-contained conveyor to assist in loading and unloading.
- 962 Trip Rider; Swamper**
- One who rides on rail cars in order to throw switches, give signals, and couple and uncouple cars.
- 969 Motorman**
- One who operates a locomotive for moving ore or rock by rail.

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**METAL/NON-METAL OPERATION CODES**

<p><b>001 Slushing</b></p> <p>The loading of broken rock or ore with the use of a scraper bucket pulled forward and backward with cables.</p>	<p><b>007 Blasting</b></p> <p>The operation of breaking ore or rock by using an explosive charge. Also called shot firing.</p>
<p><b>002 Machine Mucking</b></p> <p>The operation of loading broken rock or ore by machine usually in shafts or tunnels. The two main methods of mechanical mucking are in use in shaft sinkings: (1) Cactus grab, and (2) crawler mounted rocker shovel loaders.</p>	<p><b>008 Rock Sawing</b></p> <p>Cutting blocks of stone to specific dimensions. The cutting is often accomplished by running a continuous steel wire cable against the rock while feeding a slurry of sand and water to cause abrasion.</p>
<p><b>003 Hand Mucking</b></p> <p>Loading broken rock or ore by hand or with a shovel. Loading muck into mine cars, chutes, or conveyors. Also called car filling, rock passing, or shoveling.</p>	<p><b>009 Drilling, Percussive</b></p> <p>A form of drilling in which the rock is penetrated by the repeated impact of a reciprocating drill tool.</p>
<p><b>004 Timbering</b></p> <p>The operation of setting supports in mine workings or shafts to support the roof or face during excavation. The term support would cover the setting of timber, steel, concrete, or masonry supports.</p>	<p><b>010 Drilling, Rotary</b></p> <p>The operation of making deep holes with a drill machine that rotates a rigid tubular string of rods to which is attached a bit for cutting rock for prospecting, exploration, or valuation.</p>
<p><b>005 Rock Bolting</b></p> <p>The process of rock bolting consists of: (1) anchoring the bolt in the hole; (2) applying tension to the bolt to place the rock under compression parallel to the bolt; and (3) placing the bolts in such a pattern that they will properly support the rock structure. Rock may be supported by bolts in five ways: (1) suspension; (2) beam building; (3) reinforcement of arched opening requiring support (4) reinforcement of an opening otherwise self-supporting; and (5) reinforcement of walls against shear and compressive action.</p>	<p><b>011 Drilling, Diamond</b></p> <p>The act or process of drilling boreholes using bits inset with diamonds as the rock-cutting tool. The bits are rotated by various types and sizes of mechanisms.</p>
<p><b>006 Back Filling</b></p> <p>The filling in of a place with waste material from which the rock or ore has been removed.</p>	<p><b>012 Loading, Hauling, Dumping —Electrical Equipment</b></p> <p><b>LOADING</b>—Maneuvering material removed from the mining process into trucks, mine cars, conveyors etc. by electrical equipment. <b>HAULING</b>—The transporting of the product of the mine from the working places by electrical equipment. <b>DUMPING</b>—Unloading material taken from a mine by electrical equipment. <b>ELECTRICAL EQUIPMENT</b>—Equipment powered by electricity.</p>
	<p><b>013 Loading, Hauling, Dumping —Diesel Equipment</b></p> <p><b>LOADING</b>—Maneuvering material removed from the mining process into</p>

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- trucks, mine cars, conveyors etc. by diesel equipment.
- HAULING**—The transporting of the product of the mine from the working places by diesel equipment.
- DUMPING**—Unloading material taken from a mine by diesel equipment.
- DIESEL EQUIPMENT**—Equipment powered by diesel engines. (A type of internal-combustion engine in which air is compressed to a temperature sufficiently high to ignite fuel injected directly into the cylinder, where the combustion and expansion actuate a piston. Thermodynamically, its operation approximately follows the ideal diesel cycle. The efficiency of the diesel engine is higher than that for other engines.) Burns diesel fuel as opposed to gasoline.
- 014 Loading, Hauling, Dumping  
—Gasoline Equipment**
- LOADING**—Maneuvering material removed from the mine process into trucks, mine cars, conveyors etc. by gasoline equipment.
- HAULING**—The transporting of the product of the mine from the working places by gasoline equipment.
- DUMPING**—Unloading material taken from a mine by gasoline equipment.
- GASOLINE EQUIPMENT**—Equipment powered by gasoline (a refined petroleum naphtha which, by its composition, is suitable for use in internal combustion engines) engines.
- 015 Loading, Hauling, Dumping  
—Compressed Air Equipment**
- LOADING**—Maneuvering material removed from the mining process into trucks, mine cars, conveyors etc. by compressed air equipment.
- HAULING**—The transporting of the product of the mine from the working places by compressed air equipment.
- DUMPING**—Unloading material taken from a mine by compressed air equipment.
- COMPRESSED AIR EQUIPMENT**  
—Equipment powered by compressed air (air compressed in volume and transmitted through pipes for use as motive power for underground machines). Compressed air is
- costly to transmit long distances but has certain advantages, namely, it cools the air at the working face and is relatively safe in gassy mines.
- 016 Mining Machine Operating**
- Operations that imply the use of power machines and equipment in the excavation and extraction of ore that is not elsewhere classified.
- 017 Complete Mining Cycle**
- The cycle of operations which includes all phases of mining. This cycle may include cutting the ore, drilling the shot holes, charging and shooting the holes, loading the broken ore, and installing roof support.
- 018 Hoisting**
- The operation of raising and lowering ore, men, or materials in a shaft. The conventional system is to employ two cages actuated by a drum type of winding engine with steel ropes attached at either end of the drum, one over and the other under it, so that as one cage ascends the other descends and they arrive at the shaft top and bottom simultaneously.
- 019 Bulldozing**
- The movement of loose rock or other material by means of a curved blade mounted on the front of a heavy gasoline or diesel-driven machine.
- 020 Slurry**
- Operations involving slurry (a thin watery suspension of particles; for example, the feed to a filter press or other filtration equipment).
- 021 General Labor and Cleanup**
- Activities involving general duties and cleaning not elsewhere classified.
- 022 Crushing**
- Operations where ore is reduced into relatively coarse particles by mechanical means. This generally is the first step in the extraction of metals from ore. Among the various types of crushers are the gyratory crusher (cone) and jaw crusher. Excludes grinding operations.

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- 023 Grinding**  
Operations where ore is reduced into relatively fine particles by mechanical means. This generally follows the crushing operation and includes various types of mills such as ball mill, Hadsel mill, hammer mill, rod mill, pebble mill, stamp mill, and tube mill. Excludes crushing operations.
- 024 Roasting, Retorting**  
**ROASTING**—Heating material to a point somewhat short of fusing, with access of air, in order to expel volatile matter or cause oxidation.  
**RETORTING**—The process of distillation where volatile materials are driven off by heat and then recovered by condensation.
- 025 Drying, Filtering, Thickening**  
**DRYING**—The removal of water from a product by the application of heat.  
**FILTERING**—A process for separating solids from liquids by allowing the liquid to pass through a filtering material which retains the solids, using vacuum or pressure to accelerate the separation.  
**THICKENING**—The concentration of the solids in a liquid-solid mixture in order to recover a fraction with a higher percentage of solids than in the original mixture.
- 026 Sizing**  
The process of separating mixed particles of various sizes into groups of particles all of the same size or into groups in which all particles range between definite maximum and minimum sizes. The process is usually completed by passing the particles through screens of differing mesh size.
- 027 Concentrating**  
The act of separating and accumulating economic minerals from those of less value. Examples of concentrating equipment include flotation cell, jig, electromagnet, and shake table.
- 028 Chemical Operations**  
Any activity in the complete mining cycle where chemicals are employed in treating the product or performing a laboratory analysis not otherwise classified.
- 029 Bagging**  
The act of filling a sack with finished product in preparation for loading and shipping. The sack may be made from paper, cloth, canvas, or other material depending upon the product or method of shipment.
- 030 Pelletizing**  
A method whereby spherical pellets are formed from finely divided material.
- 031 Dredging**  
Any underwater excavation for the purpose of removing overburden from submerged ore bodies or to recover submerged deposits having commercial value.
- 032 Jet Piercing**  
The use of high velocity jet flames to drill holes and cut channels in hard rocks. It involves combustion of oxygen and a fuel oil fed under pressure through a nozzle to produce a jet flame generating a temperature of over 5,000° F. A stream of water joins the flame, and the combined effect is a spalling and disintegration of the rock into fragments which are blown from the hole or cut.
- 033 Crane Operations**  
The operation of a fixed or moveable crane.
- 034 Forklift Truck Operation**  
The operation of a truck having a forward-projecting steel fork.
- 035 Weighing**  
The operation of a scale to determine the weight of material.

## APPENDIX H (CONT.)

- 101 Track Crew**  
Operations that involve the installation and maintenance of tracks in the haulage roads of the mine where track haulage is being used.
- 102 Concrete Operations**  
Those operations involving mixing, pouring, finishing, putting up forms, etc. of concrete (mixture of stone, sand, water and a binder, usually portland cement, which hardens to a stone-like mass). Excludes bratticing.
- 103 General Shop Work**  
Any operation in a shop which is not otherwise classified. Does not include welding, mechanic, and electrician.
- 104 Welding**  
The process of joining two metal surfaces which have been heated sufficiently to melt and fuse together. Includes welding, cutting, brazing, hard surfacing, and soldering operations.
- 105 Mechanic**  
Activities that involve the repairing and assemblage of machines.
- 106 Supply Handling**  
Receiving, storing, and providing equipment, spare parts, and other materials necessary to the operation of the mine.
- 107 Technical Services**  
Operations that involve having special and unusual practical knowledge especially of a mechanical or scientific subject. Examples include directing safety, surveying, inspecting, and dust sampling.
- 108 Administration**  
The act of supervising and managing the work of miners throughout the complete mining cycle.
- 109 Electrician**  
The operation of installing, maintaining, and repairing the electrical equipment of a mine.
- 110 Ventilation**  
The provision of an adequate flow of fresh air along all roadways, workings, and service points underground. Ventilation is an essential factor in safety, health, and working efficiency and is also necessary to dilute and remove noxious or flammable gases and to abate such problems as airborne dust and high temperatures.
- 111 Scaling**  
The operation of prying loose stone from the roof.
- 112 Salvage Operations**  
Recovering timber, rails, steel arches, pipes, etc. from abandoned workings.
- 113 Lubrication**  
The operation of oiling or greasing machinery.
- 114 Battery Station Operation**  
Charging and exchanging batteries used in a mine.
- 115 Road Grading**  
Operating a machine to level mine roads.
- 116 Lamp Operations**  
Cleaning, maintaining, and servicing miners' lamps.
- 117 Carpentry**  
Building or repairing wooden structures.
- 118 Painting**  
Applying paint.

**APPENDIX H (CONT.)**

**METAL/NON-METAL LOCATION CODES**

<b>001</b>	<b>Underground Mine</b>  Locations beneath the surface of the earth where mineral or metal products are extracted and then transported to the surface. Excludes underground shops and mills.		mechanically reduced into a relatively coarse material. Examples are cone (gyratory) and jaw crushers. Excludes grinding operations.
<b>002</b>	<b>Underground Shop</b>  Locations beneath the surface of the earth in an underground mine where equipment is repaired and maintained.	<b>007</b>	<b>Surface Grinding</b>  Locations above the surface of the earth where rock or ore is mechanically reduced into a relatively fine material following crushing. Examples are ball, hammer, pebble, and rod mills. Excludes crushing operations.
<b>003</b>	<b>Underground Mill</b>  Locations beneath the surface of the earth in an underground mine where ore or rock is crushed, ground, or otherwise processed.	<b>008</b>	<b>Surface Flotation and Reagents</b>  Locations above the surface of the earth where mineral separation occurs by chemical means.
<b>004</b>	<b>Surface Mine</b>  Locations above the surface of the earth where minerals or metals are extracted.	<b>009</b>	<b>Surface Miscellaneous</b>  Locations above the surface of the earth not otherwise classified.
<b>005</b>	<b>Surface Shop</b>  Locations above the surface of the earth where equipment is repaired and maintained.	<b>010</b>	<b>Surface Mill</b>  Locations above the surface of the earth where rock or ore is processed. Excludes crushing, grinding, and flotation and reagents locations.
<b>006</b>	<b>Surface Crushing</b>  Locations above the surface of the earth where rock or ore is		

**APPENDIX I**  
**NOHSM OCCUPATION, OPERATION, AND LOCATION**  
**CODES, TITLES, AND DEFINITIONS FOR COAL MINES**

The NOHSM names and definitions of the occupations, operations, and locations were taken directly from the MSHA list of occupations, operations, and locations for coal mines.

**COAL OCCUPATION CODES**

**Underground Face**

<b>001 Belt Man/Conveyor Man</b>	underground near the face to maintain ventilation.
One who sets up and tends conveyor belts in the underground face area.	<b>009 Supply Man</b>
<b>002 Electrician</b>	One who distributes supplies (roof bolts, timbers, etc.) underground at face operations.
A specialist who is skilled in electricity who maintains electrical equipment at the face in an underground mine.	<b>010 Timberman; Propman; Jack Setter (Auger-Intake Side)</b>
<b>003 Electrician Helper</b>	One who sets roof supports. Sets the intake side jack of an auger continuous miner.
One who assists an electrician at the face in an underground mine.	<b>011 Wireman</b>
<b>004 Mechanic</b>	One who installs and repairs communication lines and electric wires at the face of an underground mine. Also called lineman, mine wireman, wire hanger.
One skilled in repairing mining equipment underground at the face.	<b>013 Cleanup Man</b>
<b>005 Mechanic Helper</b>	One who collects and loads spillage at the face of an underground mine.
One who assists a mechanic underground at the face.	<b>015 Fan Attendant</b>
<b>006 Rock Duster</b>	One who installs and maintains an auxiliary ventilation system that provides the air current in the working faces.
A person who applies rock dust (powdered limestone) to underground coal surfaces near the face to reduce explosion hazards.	<b>016 Laborer</b>
<b>007 Blaster; Shotfirer; Shooter</b>	One who works at the face of an underground mine not otherwise classified. Excludes Rockman.
One who uses explosives in an underground coal mine. Also called powdergang, powderman, and powder monkey.	<b>031 Shotfire Helper; Beater</b>
<b>008 Mason; Stopping Builder; Ventilation Man</b>	A person who helps a shotfirer at the face of an underground mine.
One who builds walls of concrete, stone, metal, or brick and mortar to close off passageways or haulageways	

## APPENDIX I (CONT.)

<b>032</b>	<b>Brattice Man</b>  One who builds brattice (ventilation walls or partitions in underground coal passageways) of wood, canvas, or other flexible material to control proper circulation of air through passageways and to working places.	<b>040</b>	<b>Headgate Operator</b>  A person who operates equipment at the head of a longwall face.
<b>033</b>	<b>Coal Drill Helper</b>  One who helps the coal drill operator underground at the face.	<b>041</b>	<b>Jack Setter (Long Wall)</b>  A person who sets the support for the roof of the mine on a longwall operation.
<b>034</b>	<b>Coal Drill Operator</b>  One who operates a hand or mobile power drill to drill holes into the underground working face of the coal to allow placement of an explosive device.	<b>042</b>	<b>Loading Machine Helper</b>  A person who assists a loading machine operator underground.
<b>035</b>	<b>Continuous Miner Helper</b>  One who provides help to the continuous miner operator.	<b>043</b>	<b>Loading Machine Operator</b>  A person who operates a mobile loading machine that loads coal into cars, or the like, for transportation from underground to the surface of the mine.
<b>036</b>	<b>Continuous Miner Operator</b>  An operator of a continuous miner (a mining machine designed to remove coal from the face without the use of drills or explosive devices and load it onto conveyors or shuttle cars).	<b>044</b>	<b>Shear Operator/Plow Operator Longwall</b>  One who operates a continuous coal-cutting machine along the longwall having a plough with knives that bite into the coal as it is pulled along the longwall face by a chain.
<b>037</b>	<b>Cutting Machine Helper</b>  One who provides help to the cutting machine operator.	<b>045</b>	<b>Rockman</b>  One who is the lead general laborer on a mining section.
<b>038</b>	<b>Cutting Machine Operator</b>  One who operates an electrically or compressed-air-driven cutting machine which is used to cut out a channel in the working face so that it may be blasted down without shattering the mass.	<b>046</b>	<b>Roof Bolter</b>  One who drills and places roof bolts at the face of underground mines to provide roof support. Boreholes are drilled upward in the roof and bolts are inserted into the holes and anchored. The bolt end protrudes below roof level and is used to support the roof bars, girders, or simple steel plates pulled tight up to the roof. Excludes roof bolter mounted.
<b>039</b>	<b>Hand Loader</b>  A miner who loads coal by shovel rather than by machine.	<b>047</b>	<b>Roof Bolter Helper</b>  One who assists a roof bolter.

## APPENDIX I (CONT.)

- 048 Roof Bolter Mounted**  
One who drills and places roof bolts with a drill mounted on a piece of machinery, for example: mounted on a continuous miner.
- 049 Section Foreman**  
A foreman who has complete charge of a section of a mine. Also called section man. Works at the face of an underground mine.
- 050 Shuttle Car Operator (On Side)**  
One who operates a truck-like vehicle to move material between the face and transfer points of an underground mine. A shuttle car has a self contained conveyor to assist in loading and unloading. The shuttle car operator and the loader (continuous miner) operator are on the same side of the entry.
- 051 Stall Driver**  
One who operates the machinery which extracts material from a limited area (stall area) at the tail of a longwall face to allow for better roof control along the rest of the face.
- 052 Tailgate Operator**  
A person who operates equipment at the tail of a longwall face.
- 053 Utility Man**  
A skilled miner capable of substituting for other miners in their absence. Works underground at the face.
- 054 Scoop Car Operator**  
One who operates a vehicle with a scoop attached to one end, used for coal haulage and cleanup work underground.
- 055 Jack Setter (Auger Return Side)**  
A person who sets the return side jack of an auger continuous miner.
- 070 Auger Operator**  
A laborer who operates an auger (boring machine) which is used to extract coal at the face of an underground mine.
- 071 Auger Helper**  
A laborer who assists the auger operator at the face of an underground mine.
- 072 Mobile Bridge Operator**  
One who operates a moveable bridge.
- 073 Shuttle Car Operator (Off Side)**  
One who operates a truck like vehicle to move material between the face and transfer points of an underground mine. The shuttle car operator and the loader (continuous miner) operator are on opposite sides of the entry. A shuttle car has a self contained conveyor to assist in loading and unloading.
- 074 Tractor Operator/Motorman**  
A worker who operates a haulage tractor or the operator of a self-propelled vehicle which is mounted on wheels with large pneumatic tires.

**APPENDIX I (CONT.)**  
**UNDERGROUND NONFACE (BUT MAY BE IN THE VICINITY)**

<b>100 Miner</b>	A skilled miner capable of substituting for other miners in their absence. Works underground away from the face.	<b>110 Timberman</b>	One who frames (cuts end and side notches) fits, and installs sets of timbers. Works anywhere underground except at the face.
<b>101 Belt Man/Conveyor Man</b>	One who sets up and tends conveyor belts away from the face.	<b>111 Wireman</b>	One who installs and repairs underground communication lines and electric wires away from the face. Also called lineman; mine wireman and wire hanger.
<b>102 Electrician</b>	A specialist who is skilled in electricity and maintains electric equipment underground away from the face in a mine.	<b>112 Belt Vulcanizer</b>	One who uses equipment to repair (vulcanize) the belt joints of underground conveyors. The process involves the use of heat, sulfur, and chemical accelerators to mend damaged conveyor belts.
<b>103 Electrician Helper</b>	One who assists or aids an electrician underground away from the face.	<b>113 Cleanup Man</b>	One who collects and loads spillage underground away from the face.
<b>104 Mechanic</b>	One skilled in repairing mining equipment underground away from the face.	<b>114 Coal Sampler</b>	One who obtains and prepares samples of coal for analysis from underground operations.
<b>105 Mechanic Helper</b>	One who assists or aids a mechanic underground away from the face.	<b>115 Fan Attendant</b>	One who installs and maintains a fan system which provides an adequate flow of fresh air in an underground mine away from the face.
<b>106 Rock Duster</b>	One who applies rock dust (powdered limestone) to underground coal surfaces away from the face to reduce explosion hazards.	<b>116 Laborer</b>	One who works underground away from the face not elsewhere classified.
<b>108 Mason; Stopping Builder; Ventilation Man</b>	A person who builds walls of concrete, stone, metal, or brick and mortar to close off passageways or haulageways underground away from the face to maintain ventilation.	<b>118 Greaser; Oiler</b>	A workman responsible for keeping underground machinery properly lubricated. Excludes beltman/conveyor man.
<b>109 Supply Man</b>	One who distributes supplies (block, timbers, etc.) underground away from the face.		

## APPENDIX I (CONT.)

- 119 Welder (Welding, Cutting, Brazing, Hard Surfacing, Soldering)**
- One who completes the following tasks underground:  
WELDING—The joining of two metal surfaces which have been heated sufficiently to melt and fuse together.  
CUTTING—Cutting metal with a high temperature flame.  
BRAZING—Joining metals by flowing a thin layer of nonferrous filler metal into the space between them. Generally exceeds 800° F.  
HARD SURFACING—The application of a hard, wear resistant alloy to the surface of a softer metal by an arc or gas-welding process.  
SOLDERING—Identical to brazing, except below 800° F.
- 122 Coal Dump Operator**
- One who controls the loading of coal at the end of a conveyor or the unloading of coal where the coal carrying cars are dumped at an underground location.
- 123 Transit Man**
- One who conducts underground surveys with a transit (a surveyor instrument that has a telescope mounted so that it can measure horizontal and vertical angles).
- 146 Roof Bolter**
- One who drills and places roof bolts in passageway ceilings to provide roof support. Boreholes are drilled upward in the roof and bolts are inserted into the holes and anchored. The bolt end protrudes below roof level and is used to support the roof bars, girders, or simple steel plates pulled tight up to the roof.
- 149 Bullgang Operator; Labor Foreman**
- One who supervises a group of laborers away from the face in an underground mine.
- 154 Belt Cleaner; Belt Picker**
- One who cleans up material around belt conveyors.
- 155 Chainman**
- One who assists a transit man in making underground surveys. Also called lineman or rodman.
- 156 Rock Driller**
- One working underground who drills into rock or slate as distinguished from coal.
- 157 Pumper**
- One who maintains the pumps in a mine that are used to force water, accumulated underground in low places, to a natural outlet or pumping station.
- 158 Rock Machine Operator**
- One who operates an underground loading machine which is used to load rock and other material (as distinguished from coal) into cars, etc., for transportation.
- 159 Water Line Man**
- One who installs and repairs water lines which carry water underground.
- 160 Shopman**
- A worker in an underground shop not elsewhere classified.
- 161 Belt Repairman**
- One who makes mechanical repairs to damaged conveyor belts.

**APPENDIX I (CONT.)**  
**TRANSPORTATION (UNDERGROUND, SOME DISTANCE FROM THE FACE)**

<b>201</b>	<b>Belt Man/Conveyor Man</b>  One who sets up and/or tends conveyor belts underground some distance from the face.	<b>261</b>	<b>Battery Station Operator</b>  One who is responsible for charging and exchanging batteries used in a mine.
<b>216</b>	<b>Trackman</b>  One who lays or repairs track for rail transportation. May work in a track crew.	<b>262</b>	<b>Brakeman; Rope Rider</b>  One who attends to a brake on an underground vehicle such as a railroad car. Also called trip rider.
<b>220</b>	<b>Cager</b>  One who loads and unloads men and material from a cage (elevator); signals hoist operator when to move cage. Works underground.	<b>263</b>	<b>Track Foreman</b>  One who supervises the track gang in laying or repairing tracks.
<b>221</b>	<b>Hoistman</b>  One who uses a hoist (drum on which cable is wound to raise and lower equipment or material in a shaft). Works underground.	<b>265</b>	<b>Dispatcher</b>  One who controls or monitors the traffic on underground haulageways and informs others when to move haulage equipment.
<b>240</b>	<b>Leader Head Operator; Roscoe Operator</b>  One who operates a conveyor belt feeder.	<b>269</b>	<b>Motorman</b>  One who operates a locomotive underground for moving men, material, supplies, or coal, by rail.
<b>250</b>	<b>Shuttle Car Operator</b>  One who drives a truck-like vehicle to move material underground some distance from the face. A shuttle car has a self-contained conveyor to assist in loading and unloading.	<b>276</b>	<b>Driver</b>  One who transports men, material, supplies, or coal underground not otherwise classified. For example: a mule driver.
		<b>277</b>	<b>Buggy Pusher</b>  One who manually pushes a small cart for transportation of coal or rock underground.

**APPENDIX I (CONT.)  
SURFACE**

<b>301</b>	<b>Conveyor Operator</b>		<p>One who operates conveyor belts on the surface used to transport coal at a mine.</p>		
<b>302</b>	<b>Electrician</b>		<p>A specialist who is skilled in electricity and maintains electrical equipment at the surface.</p>	<b>312</b>	<b>Belt Vulcanizer</b>
<b>303</b>	<b>Electrician Helper</b>		<p>One who assists or aids an electrician at the surface.</p>	<b>313</b>	<b>Cleanup Man</b>
<b>304</b>	<b>Mechanic</b>		<p>One skilled in repairing mining equipment at the surface.</p>	<b>314</b>	<b>Coal Sampler</b>
<b>305</b>	<b>Mechanic Helper</b>		<p>One who assists or aids a mechanic at the surface.</p>	<b>315</b>	<b>Fan Attendant</b>
<b>307</b>	<b>Blaster; Shotfirer; Shooter</b>		<p>One who uses explosives at a surface operation. Also called powder gang, powderman; powder monkey.</p>	<b>316</b>	<b>Laborer; Blacksmith</b>
<b>308</b>	<b>Mason</b>		<p>One who is skilled in laying brick, block, and stone at surface operations.</p>	<b>318</b>	<b>Greaser; Oiler</b>
<b>309</b>	<b>Supply Man</b>		<p>One who distributes supplies on the surface.</p>	<b>319</b>	<b>Welder; (Shop) Blacksmith</b>
<b>310</b>	<b>Pan Scraper Operator</b>		<p>One who operates a vehicle that removes material by scraping material into a pan and later dumping the material into a desired location. Example: removes topsoil for reclamation purposes.</p>	<b>320</b>	<b>Cage Attendant/Cager</b>
<b>311</b>	<b>Wireman</b>		<p>One who installs and repairs surface communication lines and electric wires. Also called lineman, mine wireman, wire hanger.</p>		

## APPENDIX I (CONT.)

<b>321 Hoist Engineer/Operator</b>	<b>345 Crusher Attendant</b>
One who uses a hoist (drum on which cable is wound to raise and lower equipment or material in a shaft). Works on the surface.	One who regulates the amount of material fed into crushers and/or operates the crusher on the surface.
<b>323 Transit Man</b>	<b>347 Froth Cell Operator</b>
One who conducts surface surveys with a transit (a surveying instrument that has a telescope mounted so that it can measure horizontal and vertical angles).	One who operates a process for cleaning fine coal on the surface in which the coal, with the aid of a reagent, becomes attached to air bubbles in a liquid medium and floats as a froth. The coal particles are thus removed from impurities.
<b>331 Clam Operator</b>	<b>348 Machinist</b>
One who operates a twin-jawed bucket hung from a boom by a cable in order to pick up, transport, and dump material at surface operations.	One who is skilled in the use of metal working tools on the surface.
<b>333 Coal Drill Helper</b>	<b>349 Rotary Dump Operator</b>
One who assists the coal drill operator at surface operations.	One who operates an apparatus on the surface for overturning mine cars to discharge coal.
<b>334 Coal Drill Operator</b>	<b>350 Shuttle Car Operator</b>
One who operates a hand held or mobile power drill for drilling holes in coal at surface operations.	One who operates a truck-like vehicle to move material between transfer points on the surface. A shuttle car has a self-contained conveyor to assist in loading and unloading.
<b>341 Beltman/Conveyor Man</b>	<b>351 Scoop Operator</b>
One who sets up and tends conveyor belts at surface operations.	One who operates a vehicle with a scoop attached to one end for material haulage and cleanup work at surface operations.
<b>342 Bit Sharpener</b>	<b>352 Steel Worker</b>
One who operates a bit grinding machine that shapes and sharpens cutting edges of detachable drilling bits. Also called bit grinder.	A construction worker employing steel, iron, or other metal products.
<b>343 Car Trimmer/Car Loader</b>	<b>354 Sweeper Operator</b>
One who loads material into a car on the surface.	One who operates mobile equipment to remove dust at surface operations.
<b>344 Car Shake-Out Operator</b>	<b>355 Chainman</b>
One who operates a mechanical device on the surface to empty material from a car by vibrating or shaking the car.	One who assists a transit man in making surface surveys. Also called lineman or rodman.

## APPENDIX I (CONT.)

<p><b>356 Rock Driller</b></p> <p>One who drills holes into rock for blasting purposes at surface operations. Excludes driller; highwall operator.</p>	<p><b>368 Bulldozer Operator</b></p> <p>One who operates a heavy gasoline or diesel-driven machine having a front-mounted vertical blade for moving earth or coal.</p>
<p><b>357 Washer Operator</b></p> <p>One who washes coal, using equipment such as launders, shakers, screens, and conveyors to separate coal from slate, rock, and other impurities, usually by gravity separation. Also called coal-washer tender; wash-coal conveyorman; washerman. Excludes froth cell operator.</p>	<p><b>369 Motorman</b></p> <p>One who operates a locomotive at surface operations for moving material by rail.</p>
<p><b>360 Shopman Repair Cars</b></p> <p>One who repairs haulage vehicles in a shop.</p>	<p><b>370 Auger Operator</b></p> <p>One who operates an auger (boring machine) which is used to extract coal at surface operations.</p>
<p><b>362 Brakeman</b></p> <p>One who attends to a brake on a surface vehicle such as a railroad car. Also called trip rider.</p>	<p><b>371 Auger Helper</b></p> <p>A laborer who assists the auger operator at surface operations.</p>
<p><b>365 Dispatcher</b></p> <p>One who controls and monitors the traffic on surface haulageways and informs others when to move haulage equipment.</p>	<p><b>372 Barger Attendant</b></p> <p>One who works on a barge (water craft for transportation of material).</p>
<p><b>366 Waterboy</b></p> <p>One who supplies drinking water to other miners.</p>	<p><b>373 Car Dropper</b></p> <p>One who controls the movement of material-carrying cars to be loaded or dumped.</p>
<p><b>367 Coal Shovel Operator</b></p> <p>One who operates a mechanical device on the surface for excavating and loading coal consisting of a digging bucket at the end of an arm suspended from a boom which extends from the powerplant of the machine. When digging, the bucket moves forward and upward so that the machine does not excavate below the level on which it stands.</p>	<p><b>374 Cleaning Plant Operator</b></p> <p>One who operates a coal preparation plant or cleaning plant. For example: may operate froth cell, washers, etc.</p>
	<p><b>375 Road Grader Operator</b></p> <p>One who operates a machine to level mine roads.</p>
	<p><b>376 Coal Truck Driver</b></p> <p>One who operates a self-propelled (gasoline or diesel) wheeled vehicle which operates on public or private highways to transport material between transfer points.</p>

**APPENDIX I (CONT.)**

<p><b>378 Dragline Operator; Crane Operator</b></p> <p>One who operates excavating equipment with a wire rope-hung bucket often used for removing overburden at surface coal mines.</p>	<p><b>387 Rotary Bucket Excavator Operator</b></p> <p>One who operates mobile equipment with rotary buckets.</p>
<p><b>379 Dryer Operator</b></p> <p>One who operates a device which removes the moisture from coal.</p>	<p><b>388 Scalper - Screen Operator</b></p> <p>One who separates material from coal that is being processed. Also called screenman.</p>
<p><b>380 Fine Coal Plant Operator</b></p> <p>One who operates a facility which produces small size coal particles.</p>	<p><b>390 Silo Operator</b></p> <p>One who controls the loading and unloading of a coal storage silo.</p>
<p><b>381 Hoist Operator Helper</b></p> <p>One who assists the hoist operator.</p>	<p><b>391 Stripping Shovel Operator</b></p> <p>One who operates a mechanical device on the surface for excavating and loading overburden consisting of a digging shovel at the end of an arm suspended from a boom which extends from the powerplant of the machine.</p>
<p><b>382 Highlift Operator</b></p> <p>One who operates a mobile machine for lifting and transporting materials to and from locations on the surface.</p>	<p><b>392 Tipple Operator</b></p> <p>One who operates a surface facility which receives and loads coal to be transported from the facility.</p>
<p><b>383 Driller; Highwall Helper</b></p> <p>One who assists the driller of the highwall.</p>	<p><b>393 Weighman</b></p> <p>One who determines the weight of material by use of a scale. Also called scaleman.</p>
<p><b>384 Driller; Highwall Operator</b></p> <p>One who drills holes into overburden in preparation for blasting at surface operations.</p>	<p><b>394 Carpenter</b></p> <p>One who builds or repairs wooden structures.</p>
<p><b>385 Lampman</b></p> <p>A person having responsibility for cleaning, maintaining, and servicing of miners' lamps. Also called lamp cleaner; lamp-house man lamp keeper; lamp repairer; safety-lamp keeper.</p>	<p><b>395 Water Truck Operator</b></p> <p>One who operates a truck which applies water to reduce dust generation.</p>
<p><b>386 Refuse Truck Driver</b></p> <p>One who operates a truck which removes tailings or waste material from surface operation sites.</p>	<p><b>396 Watchman</b></p> <p>One who patrols facilities to prevent theft.</p>
	<p><b>397 Yard Engine Operator</b></p> <p>One who operates a locomotive which moves material carrying railcars</p>

**APPENDIX I (CONT.)**

- |            |   |            |   |
|------------|---|------------|---|
| <b>398</b> | <p>for loading and unloading purposes on the surface.</p> <p><b>Gronndman</b></p> <p>One who removes spillage from the madbed where power shovels travel.</p> | <b>399</b> | <p><b>Laboratory Technician</b></p> <p>One who assists or completes tests or analysis often of a chemical nature in support of mining activity.</p> |
|------------|---|------------|---|

**APPENDIX I (CONT.)  
ADMINISTRATION/MANAGEMENT**

<b>402</b>	<b>Master Electrician</b>		
	A specialist who is skilled in electricity and maintains electrical equipment in a mine and often oversees the work of other electricians.		lems involving the properties of matter and sources of energy; or one who assists in such activity. For example an electrical engineer designs and specifies the system to safely transport electricity to mining equipment.
<b>404</b>	<b>Master Mechanic</b>	<b>462</b>	<b>Fireboss, Pre-Shift Examiner</b>
	One skilled in assembling and repairing mining equipment and often oversees the work of other mechanics.		A person designated to examine the mine for gas and other dangers usually before but also during the shift. Also called mine examiner.
<b>414</b>	<b>Dust Sampler</b>	<b>464</b>	<b>Inspector</b>
	One who assesses the airborne dust content of the mine environment.		One who checks the mine to determine the health and safety conditions.
<b>418</b>	<b>Maintenance Foreman</b>	<b>481</b>	<b>Superintendent</b>
	One who supervises the work of the maintenance crew such as mechanics, electricians, etc.		One who supervises the overall work at one or more mining facilities.
<b>423</b>	<b>Surveyor</b>	<b>489</b>	<b>Outside Foreman</b>
	One skilled in the science of making angular and distance measurements necessary to determine the relative position of points on or beneath the surface of the earth or to establish such points. Locates boreholes, shafts, and tunnels in order to document and guide mining activity. Often supervises the work of the transit man.		A foreman who supervises all operations at the surface of a mine. May report to a superintendent.
<b>430</b>	<b>Assistant Mine Foreman/Assistant Mine Manager</b>	<b>494</b>	<b>Prep Plant Foreman</b>
	One who provides aid to the mine foreman or mine manager.		A foreman who supervises all operations at a coal preparation plant. May report to a superintendent.
<b>449</b>	<b>Mine Foreman, Mine Manager</b>	<b>495</b>	<b>Safety Director</b>
	One charged with the general supervision of the workings of a mine and the persons employed therein. The foreman or manager may report to a superintendent.		One in charge of health and safety for a mine or several mines. May supervise mineral industrial safety officers.
<b>456</b>	<b>Engineer (Electrical, Ventilation, Mining)</b>	<b>496</b>	<b>Union Representative</b>
	One who is skilled in the application of science and mathematics to practical prob-		One who represents the concerns of a union of workers in discussions with the management of a mine. Excludes safety representative.
		<b>497</b>	<b>Clerk, Timekeeper</b>
			A member of the administrative staff of a mine who is responsible for record keeping.

## APPENDIX I (CONT.)

**590 Education Specialist**

One who provides training to miners over a broad range of subjects. (Excludes safety topics.)

**591 Mineral Industrial Safety Officer**

One who is responsible for seeing that mine work is completed in a safe manner. Investigates and reports on accidents and remedial measures. May report to a safety director.

**592 Mine Safety Instructor**

One who provides training to miners on health and safety related topics such as first aid, mine rescue, mine fires, respirator use, etc.

**593 Safety Representative**

A representative of miners who recommends action on safety concerns to mine management.

**APPENDIX I (CONT.)  
COAL OPERATION CODES**

- |  |  |
|--|--|
| <p><b>001 Hand Mucking</b></p> <p>The operation of loading broken coal or other material by hand with a shovel.</p>  | <p><b>007 Loading, Hauling, Dumping<br/>—Diesel Equipment</b></p> <p><b>LOADING</b>—Maneuvering material removed from the mining process into trucks, mine cars, conveyors, etc. by diesel equipment.<br/><b>HAULING</b>—The transporting of the product of the mine from the working places by diesel equipment.<br/><b>DUMPING</b>—Unloading material taken from a mine by diesel equipment.<br/><b>DIESEL EQUIPMENT</b>—Equipment powered by diesel engines (a type of internal combustion engine in which air is compressed to a temperature sufficiently high to ignite fuel injected directly into the cylinder, where the combustion and expansion actuate a piston. Thermodynamically, its operation approximately follows the ideal diesel cycle. The efficiency of the diesel engine is higher than that for other engines). Burns diesel fuel as opposed to gasoline.</p> |
| <p><b>002 Timbering</b></p> <p>The operation of setting supports in mine workings or shafts to support the roof or face during evacuation.</p>   | <p><b>008 Loading, Hauling, Dumping<br/>—Gasoline Equipment</b></p> <p><b>LOADING</b>—Maneuvering material removed from the mining process into trucks, mine cars, conveyors, etc. by gasoline equipment.<br/><b>HAULING</b>—The transporting of the product of the mine from the working places by gasoline equipment.<br/><b>DUMPING</b>—Unloading material taken from a mine by gasoline equipment.<br/><b>GASOLINE EQUIPMENT</b>—Equipment powered by gasoline (a refined petroleum naphtha which, by its composition, is suitable for use in internal combustion engines) engines.</p>  |
| <p><b>003 Roof Bolting</b></p> <p>A system of roof support in mines. Boreholes are drilled upward in the roof and bolts are inserted into the holes and anchored by expansion shells; resin cartridges; or similar devices. The protruding bolt head below roof level is then used to support roof bars, girders, or simple steel plates pulled tight up to the roof. The idea is to clamp together roof beds to form a composite beam with a strength considerably greater than the sum of the individual beds acting separately.</p> | <p><b>009 Loading, Hauling, Dumping<br/>—Compressed Air Equipment</b></p> <p><b>LOADING</b>—Maneuvering material removed from the mining process into trucks, mine cars, conveyors, etc. by compressed air equipment.<br/><b>HAULING</b>—The transporting of the product of the mine from the working places by compressed air equipment.</p>  |
| <p><b>004 Blasting</b></p> <p>The operation of breaking coal by boring a hole in it, inserting an explosive device, and detonating or firing it. Also called shot firing.</p>  |  |
| <p><b>005 Drilling</b></p> <p>The act or process of making a circular hole with a drill for blasting.</p>  |  |
| <p><b>006 Loading, Hauling, Dumping<br/>—Electrical Equipment</b></p> <p><b>LOADING</b>—Maneuvering material removed from the mining process into trucks, mine cars, conveyors, etc. by electrical equipment.<br/><b>HAULING</b>—The transporting of the product of the mine from the working places by electrical equipment.<br/><b>DUMPING</b>—Unloading material taken from a mine by electrical equipment.<br/><b>ELECTRICAL EQUIPMENT</b>—Equipment powered by electricity.</p>   |  |

## APPENDIX I (CONT.)

- DUMPING—Unloading material taken from a mine by compressed air equipment.
- COMPRESSED AIR EQUIPMENT—Equipment powered by compressed air (air compressed in volume and transmitted through pipes for use as motive power for underground machines).
- 010 Mining Machine Operating**
- Operations that involve the use of power machines and equipment in the excavation and extraction of coal that is not elsewhere classified.
- 011 Track Crew**
- Operations that involve the installation and maintenance of rail tracks in the mine.
- 012 Complete Mining Cycle**
- The cycle of operations which includes all phases of mining. This cycle may include cutting the coal, drilling the shot holes, charging and shooting the holes, loading the broken coal, installing roof support, and hauling.
- 013 Hoisting**
- The operation of raising and lowering coal, men, or materials in a shaft. The conventional system is to employ two cages actuated by a drum type of winding engine with steel cables attached at either end of the drum, one over and the other under it, so that as one cage ascends the other descends and they arrive at pit top and bottom simultaneously.
- 014 Bulldozing**
- The movement of earth or coal by means of a curved blade mounted on the front of a heavy gasoline or diesel driven machine.
- 015 Crushing**
- Operations where coal is reduced into a relatively coarse material by mechanical means.
- 016 Sizing**
- The process of separating coal particles of various sizes into groups of particles all of the same size, or into groups in which all particles range between definite maximum and minimum sizes. The process is usually completed by passing the particles through screens of differing mesh size.
- 017 Washing**
- The act of separating saleable coal from impurities by using differences in specific gravity. The separation may occur in air, water, air and sand, water and sand, water and chemicals (float sink), etc.
- 018 Administration**
- The act of supervising and managing the work of miners.
- 019 Drying**
- The removal of water from coal by the application of heat.
- 020 Continuous Mining**
- Mining coal by a machine (continuous miner) that removes coal from the face and loads it into cars or conveyors without the use of drills or explosives.
- 021 Longwall Mining**
- An underground method of coal extraction where coal is removed in one operation by means of a shear or plow along a face or wall (may be several hundred feet).
- 022 Auger Mining**
- Coal extraction by means of a boring machine (Auger). As the auger turns, the head breaks the coal and the screw removes it, much like boring holes in wood.

## APPENDIX I (CONT.)

<p><b>023 Silo Operations</b></p> <p>Controlling the loading or unloading of a coal storage silo.</p>	<p><b>108 Belt Maintenance</b></p> <p>Operations involving repair and upkeep of conveyor belt systems including the belt itself, a driving unit, supporting structure, and idler rollers between the terminal drums and accessories, which include devices for maintaining belt tension and equipment for cleaning and protecting the belt.</p>
<p><b>024 Weighing</b></p> <p>Determining the weight of material by use of a scale.</p>	<p><b>109 Bratticing</b></p> <p>Building and maintaining ventilation walls or partitions (brattices) in underground passageways.</p>
<p><b>101 Concrete Operations</b></p> <p>Those operations involving mixing, pouring, finishing, putting up forms, etc. of concrete (an intimate mixture of stone, sand, water, and a binder, usually portland cement, which hardens to a stonelike mass). Excludes bratticing.</p>	<p><b>110 Electrician</b></p> <p>The operation of maintaining and repairing the electrical wiring and equipment of a mine.</p>
<p><b>102 General Labor &amp; Cleanup</b></p> <p>Activities involving general duties and cleaning not elsewhere classified.</p>	<p><b>111 Ventilation</b></p> <p>The provision of an adequate flow of fresh air along all roadways, workings, and service points underground. Ventilation is an essential factor in safety, health, and working efficiency and is also necessary to dilute and remove noxious or flammable gases and to abate such problems as dust.</p>
<p><b>103 General Shop Work</b></p> <p>Any operation in a shop which is not otherwise classified. Does not include welding, mechanic, and electrician.</p>	<p><b>112 Rock Dusting</b></p> <p>The act of applying powdered limestone to underground coal surfaces thereby reducing explosion hazards.</p>
<p><b>104 Welding</b></p> <p>The process of joining two metal surfaces which have been heated sufficiently to melt and fuse together. Includes operations of cutting, brazing, hard surfacing, and soldering.</p>	<p><b>113 Lubrication</b></p> <p>The operation of oiling or greasing machinery.</p>
<p><b>105 Mechanic</b></p> <p>Activities that involve the repairing and assemblage of machines.</p>	<p><b>114 Battery Station Operation</b></p> <p>Charging and exchanging batteries used in a mine.</p>
<p><b>106 Supply Handling</b></p> <p>Receiving, storing, and providing equipment, spare parts, and other materials necessary to the operation of the mine.</p>	
<p><b>107 Technical Services</b></p> <p>Operations that involve having special and unusual practical knowledge especially of a mechanical or scientific subject. Examples include directing</p>	

## APPENDIX I (CONT.)

- |            |   |            |  |
|------------|---|------------|--|
| <b>115</b> | <b>Dispatching</b><br>Controlling or monitoring the traffic on haulageways.   | <b>119</b> | <b>Water Truck Operations</b><br>Applying water to reduce dust generation. |
| <b>116</b> | <b>Road Grading</b><br>Operating a machine to level mine roads.               | <b>120</b> | <b>Security</b><br>Patrolling facilities to prevent theft.                 |
| <b>117</b> | <b>Lamp Operations</b><br>Cleaning, maintaining, and servicing miners' lamps. | <b>121</b> | <b>Pump Maintenance</b><br>Lubricating and maintaining pumps.              |
| <b>118</b> | <b>Carpentry</b><br>Building or repairing wooden structures.                  |            |  |

**APPENDIX I (CONT.)  
COAL LOCATION CODES**

<b>001</b>	<b>Underground Mechanized Mining Unit</b>  Locations by the transfer point to a belt line or other means of moving the coal out of the mine.	<b>006</b>	<b>Coal Preparation Plant</b>  Locations where raw coal is cleaned and sized following extraction.
<b>002</b>	<b>Underground Shop</b>  Specially equipped locations beneath the surface of the earth in an underground coal mine where mining equipment is repaired or maintained.	<b>007</b>	<b>Underground Warehouse</b>  Underground locations which are dedicated primarily to the storage of supplies used for mine operations of any kind.
<b>003</b>	<b>Surface Pit</b>  Locations above the surface of the earth where coal is extracted by the removal of overburden (the soil and rock above the coal). Includes auger mining locations where coal is brought to the surface using boring machines. Includes haulage roads.	<b>008</b>	<b>Underground Miscellaneous</b>  Underground locations which are not otherwise classified. Includes underground belt line and haulage areas.
<b>004</b>	<b>Surface Shop</b>  Locations above the surface of the earth where equipment is repaired or maintained.	<b>009</b>	<b>Surface Warehouse</b>  Surface locations which are dedicated primarily to the storage of supplies used for mine operations of any kind.
<b>005</b>	<b>Surface Miscellaneous</b>  Locations above the surface of the earth not otherwise classified.	<b>010</b>	<b>Surface Laboratory</b>  Surface locations which are dedicated primarily to the analysis or examination of any substance or material.
		<b>011</b>	<b>Surface Bathhouse</b>  Surface locations available for miners to shower or change clothes.

**APPENDIX J**  
**INTENDED CONTROL CODES, NAMES, AND DEFINITIONS**

The intended controls are defined as the measures which were intended by management to protect the employees to any potential exposures.

**PERSONNEL PROTECTIVE EQUIPMENT**

<b>EP</b>	<b>Ear (Hearing) Protection</b>  Muffs, Plugs. The wearing of ear plugs or muffs to protect ones hearing from noise.	<b>CH</b>	<b>Chemical Cartridge Respirator (Half Facepiece)</b>  The wearing of a half facepiece chemical cartridge respirator to protect the respiratory system.
<b>EF</b>	<b>Eye and Face Protection</b>  Face shields, Safety glasses, Welding helmets, Laser glasses, and Goggles. The use of any protection against some form of electromagnetic radiation from a welding operation or similar source.	<b>CQ</b>	<b>Chemical Cartridge Respirator (Quarter Facepiece)</b>  The wearing of a quarter facepiece chemical cartridge respirator to protect the respiratory system.
<b>HG</b>	<b>Hand Gloves</b>  The use of gloves to control a potential skin exposure.	<b>FF</b>	<b>Particulate Filter Respirator (Full Facepiece)</b>  The wearing of a full facepiece particulate filter respirator to protect the respiratory system.
<b>BC</b>	<b>Barrier Cream</b>  The use of barrier cream to control a potential skin exposure.	<b>FH</b>	<b>Particulate Filter Respirator (Half Facepiece)</b>  The wearing of a half facepiece particulate filter respirator to protect the respiratory system.
<b>PA</b>	<b>Apron</b>  The wearing of an apron to control a health-related agent.	<b>FQ</b>	<b>Particulate Filter Respirator (Quarter Facepiece)</b>  The wearing of a quarter facepiece particulate filter respirator to protect the respiratory system.
<b>PC</b>	<b>Coat</b>  The wearing of a coat to control a health-related agent.	<b>FP</b>	<b>Powered Air Purifying Respirator</b>  The wearing of a powered air purifying respirator to protect the respiratory system.
<b>PP</b>	<b>Pants</b>  The wearing of pants to control a health-related agent.	<b>RF</b>	<b>Combined Particulate Filter &amp; Chemical Cartridge Respirator (Full Facepiece)</b>  The wearing of a full facepiece respirator which uses the particulate filter and the chemical cartridge to protect the respiratory system.
<b>PS</b>	<b>Full Protective Suit</b>  The wearing of a full protective suit to control a health-related agent.		
<b>CF</b>	<b>Chemical Cartridge Respirator (Full Facepiece)</b>  The wearing of a full facepiece chemical cartridge respirator to protect the respiratory system.		

## APPENDIX J (CONT.)

**RH Combined Particulate Filter & Chemical Cartridge Respirator (Half Facepiece)**

The wearing of a half facepiece respirator which uses the particulate filter and the chemical cartridge to protect the respiratory system.

**RQ Combined Particulate Filter & Chemical Cartridge Respirator (Quarter Facepiece)**

The wearing of a quarter facepiece respirator which uses the particulate filter and the chemical cartridge to protect the respiratory system.

**GR Gas Mask (Canister) Respirator Devices**

The wearing of a gas mask (canister) respirator to protect the respiratory system.

**SR Supplied Air Respiratory Devices**

The wearing of a self-contained respiratory apparatus, an air line respirator, a hose mask with and without blowers or abrasive blasting helmets, hoods, or masks to protect the respiratory system.

**OR Other Respiratory Devices**

The wearing of any respirator that is not listed above to protect the respiratory system.

## APPENDIX J (CONT.)

### VENTILATION

#### **DV Dilation Ventilation**

The dilution of contaminated air with uncontaminated air in the underground mine, room, or building for the purpose of health hazard or nuisance control. This includes systems with:

1. Supply fans in which air is used to create a slight positive pressure which forces air out of the mine or building through relief vents or openings.
2. Exhaust fans which allow air to be removed from a space by creating a slight reduction of pressure which causes outdoor air to be brought in through vents or openings.
3. Both exhaust and supply air fans.

#### **LV Local Exhaust Ventilation**

Local exhaust ventilation prevents the spread of air contaminants throughout the working atmosphere. The criteria for local exhaust should always be that the contaminant is controlled at its source of generation. This may include exhaust ventilated process enclosures such as drilling machines, paint spray booths, welding booths, and abrasive blasting booths.

Local exhaust ventilation also includes canopy hoods, slot ventilation hoods, flexible hose ventilation, tailpipe exhaust systems, downdraft hoods, and sidedraft hoods.

#### **NV Natural Ventilation**

The dilution of contaminated air with uncontaminated air in the underground mine, room, or building for the purpose of health hazard or nuisance control. This includes systems with:

1. Supply fans in which air is used to create a slight positive pressure which forces air out of the mine or building through relief vents or openings.
2. Exhaust fans which allow air to be removed from a space by creating a slight reduction of pressure which causes outdoor air to be brought in through vents or openings.
3. Both exhaust and supply air fans.

#### **LG Local Gravity Ventilation**

Ventilation using ducted thermal ventilation with no mechanical fans such as stove flues, melt pots, etc., to prevent the spread of air contaminants throughout the working atmosphere.

**APPENDIX J (CONT.)  
OTHER MEANS OF CONTROL**

<b>AC</b>	<b>Administration</b>  Rest periods for heat exposures and rotation of workers for the purpose of controlling exposure.	<b>OC</b>	<b>Other Controls</b>  Any control used that is not listed in this appendix.
<b>IC</b>	<b>Isolation, Enclosure, Shielding</b>  Any special attempt to physically separate the worker from a health related agent for the purpose of controlling exposure.	<b>WA</b>	<b>Water Spray with Additive</b>  Water sprays with additives used as a dust control.
<b>NC</b>	<b>No Control</b>  No use of controls while potentially exposed to a chemical or physical agent.	<b>WS</b>	<b>Water Spray</b>  Water sprays used as a dust control.

**APPENDIX K**  
**STONE, DIMENSION, NEC COMMODITY REPORT**

**NATIONAL OCCUPATIONAL HEALTH SURVEY OF MINING**

**STONE, DIMENSION, NEC REPORT**

Comments should be directed to:

Project Officer  
National Occupational Health Survey of Mining  
NIOSH  
Division of Respiratory Disease Studies  
1095 Willowdale Road  
Morgantown, West Virginia 26505-2888

## **APPENDIX K (CONT.)**

### **TABLE OF CONTENTS**

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## APPENDIX K (CONT.) INTRODUCTION

This is one of a series of reports on the National Occupational Health Survey of Mining (NOHSM), which has been carried out by the National Institute for Occupational Safety and Health (NIOSH). The NOHSM began in May 1984, as an effort by NIOSH to obtain representative data related to occupational health from the mining industry. This particular report provides NOHSM data for the Stone, Dimension, NEC commodity. During the site selection process, three (3) sample sites were selected from the Stone, Dimension, NEC population of active mining facilities. Of these, two (2) were surveyed between August 28, 1986, and November 25, 1986, but because of production inactivity during the survey period, it was not possible to conduct a survey at the other site. The data collected were similar to the information previously obtained in non-mining studies. Specifically, NOHSM data include:

- a. Occupational health program and policy information;
- b. An inventory of all health-related substances found on mine property; and
- c. A series of worksite observations which detail potential exposure to chemical and physical agents.

These data were collected by surveyors who traveled to each mine site. The survey sites were chosen so as to provide a statistically valid representation of each commodity at the time of the NOHSM sample selection. With this representative sample, NIOSH can project survey data to the entire mining industry.

The NOHSM is being carried out primarily as a service to the Mine Safety and Health Administration (MSHA), and secondarily as a source of information for NIOSH investigators and other interested parties. MSHA plans to use the data for three purposes:

1. To set regulatory priorities and write improved health standards;
2. To improve compliance with existing standards; and
3. To identify and determine research needs and priorities.

This transfer of information to MSHA is mandated by Section 201 of the 1977 Federal Mine Safety and Health Amendments Act.

This report identifies potential exposures and provides the associated numbers of workers, the occupations of those workers, and the locations on the mine property where the potential exposures were observed. This information is categorized into seven tables: four concerning chemical agents; one concerning musculoskeletal overload conditions; one concerning physical agent conditions; and one concerning welding processes. Estimated annual usage information is provided for chemical substances, both generic and trade names.

This report lists the survey findings in a number of individual tables representing the different products and conditions to which workers in the commodity were found to be

## APPENDIX K (CONT.)

potentially exposed. The following is a breakdown of these tables, including the number of agents associated with each table, for the Stone, Dimension, NEC commodity:

Table K1 . . . .4	MSHA-regulated chemicals.
Table K2 . . . .1	Chemical that had a NIOSH recommended exposure limit but is not MSHA-regulated.
Table K3 . . . .2	Chemicals that have no NIOSH recommended exposure limit and are not MSHA-regulated.
Table K4 . . . .36	Trade name products.
Table K5 . . . .4	Physical agent conditions.
Table K6 . . . .7	Musculoskeletal overload conditions.
Table K7 . . . .2	Welding processes.

It is extremely important that the limitations of the reported data be recognized. The data do not in any way document exposures or exposure levels. The data only indicate **potential exposures**. The term "*potential exposure*" means the agent was observed to be present at one or more worksites in such a way that there was a possibility of workers being exposed to the agent.

Likewise, the usage data presented in some of the tables are only a guide to the projected **magnitude** of usage and should not be taken as precise information. The usage data are based on estimates provided by mine management. It is expected that these estimates have widely varying accuracy. Occasionally, an item may be represented as having an annual usage of zero with workers observed to be potentially exposed. This may occur because annual usage estimates are generally based on purchases of the 12 months immediately preceding a survey. Therefore, items purchased prior to that 12 month period may be represented as having a zero annual usage rate even though potential exposures were observed during the survey. Other zero annual usage occurrences could involve recyclable items such as some catalysts and desiccants, items such as paints and coatings which are applied prior to the 12 month period but which are present in the workplace in such a way as to present a potential exposure, and obsolete items which are no longer actively used on the property but to which employees could still be potentially exposed in the course of their work. Furthermore, all the estimates were rounded to the nearest whole number, with all quantities between 0 and 1 being reported as 1. Thus, extremely small usage levels may actually be lower than estimated. With this possible exception, NIOSH believes the relative magnitude to be appropriately represented.

Another limitation to be observed is the terminology associated with the **commodity, occupation and location**. These terms were adapted directly from MSHA information and applied by NIOSH. NIOSH recognizes that other parties may prefer other commodity, occupation, or location terminology. The MSHA terms were used because of MSHA's close interest in the data.

A separate report will be prepared for each commodity surveyed as a part of the NOHSM. During each segment of the NOHSM, approximately 120 mining operations were surveyed as the sample from a number of selected commodities. A different set of

## **APPENDIX K (CONT.)**

commodities was surveyed during each segment. NIOSH plans for use of these data in the future include:

- a. Encourage MSHA use of the data, as outlined above;
- b. Determine the ranges of exposure to various agents, as required by Section 201 of the 1977 Federal Mine Safety and Health Amendments Act;
- c. Assist in setting priorities for mine-related occupational health research; and
- d. Respond to questions from other parties regarding occupational health aspects of the mining industry.

Information beyond that presented in this report has been collected during the NOHSM. All of the information not protected by trade secret claims is available to the public upon detailed written request. Other categories of available information include:

- a. Management policies related to occupational health;
- b. Duration of potential exposures;
- c. Operations associated with potential exposures;
- d. Controls employed with potential exposures; and
- e. Results of bulk dust analyses for silica, metals, and fibers.

Interested parties should direct their requests to:

Project Officer  
National Occupational Health Survey of Mining  
NIOSH  
Division of Respiratory Disease Studies  
1095 Willowdale Road  
Morgantown, WV 26505-2888

## TABLE DEFINITIONS

AGENT NAME	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)**	(2a) STANDARD DEVIATION	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)**	(4) PREDICTED ANNUAL USAGE**	(5) OCCUPATIONS	(6) LOCATIONS
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Column (1) represents the total number of workers in occupations within this commodity in which a potential exposure to an agent was observed or identified through questioning of mine management or workers. This number only includes workers from the NOHSM sample sites. A "potential exposure" means the agent was observed to be present at the worksite in such a way that there was a possibility of workers being exposed to the agent. The potential exposures do not imply any exposure level, nor do they imply the absence or presence of controls.

Column (2) represents the number of workers within this commodity predicted to be potentially exposed to each agent. This number reflects a projection to this entire commodity, based on data obtained at NOHSM sample sites.

Column (2a) represents the standard deviations for the projections to this entire commodity that are described in column (2). These standard deviations can provide a rough indicator of the variance about these projections.

Column (3) represents the percentage of workers within this commodity predicted to be potentially exposed to each agent. Column (3) is obtained by dividing column (2) by the projected total population of workers in the commodity.

Column (4) represents the number of gallons (GAL) or the number of pounds (LBS) of each chemical that NIOSH has estimated to be used per year. This number is obtained from projections based on estimates of usage provided by mine management, and should only be used in determining the order of magnitude of usage. It should not be used as a precise figure. This number reflects a projection to this entire commodity, based on data obtained at NOHSM sample sites. In some cases, where usage data was unavailable, an "\*" appears in this column.

Column (5) contains the occupations observed to have a potential for exposure to this agent. In each occupation, the percentage of workers with a potential for exposure to the agent is given in parentheses. This number only includes data obtained at NOHSM sample sites.

Column (6) contains the locations where workers were observed to have a potential for exposure to this agent at the NOHSM sample sites. The percentage of workers in each listed location with a potential exposure to the agent is given in parentheses. This number only includes data obtained at NOHSM sample sites.

\*\*For the commodities in which NIOSH surveyed all of the active facilities, Columns 2, 3, and 4 are observed data rather than predicted data.

**TABLE K1, PAGE 1 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**  
**MSHA REGULATED CHEMICALS FOUND ON MINE PROPERTY**  
**COMMODITY NAME: STONE, DIMENSION, NEC**

CHEMICAL NAME	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(2a) STANDARD DEVIATION	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(5) OCCUPATIONS	(6) LOCATIONS
ACETYLENE	7	20	17	19	68,243 GALS	604 MECHANIC (100%) 640 ADMN, SUPERVISORY, MGT PERSNL (50%)	010 SURFACE MILL (38%) 005 SURFACE SHOP (100%)
AMMONIUM CHLORIDE	3	9	7	8	14,621 LBS	379 DRYER OPTR; KILN OPTR (100%)	010 SURFACE MILL (19%)
CHROMIC ACID AND CHROMATES	3	9	7	8	73,106 LBS	579 SLURRY, MIXING OR PUMPING WRKR (100%)	010 SURFACE MILL (19%)
GASOLINE, LEADED	10	54	37	49	22,341 GALS	079 CRUSHER OPTR (100%) 616 LABORER; BULLGANG (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%) 389 FORKLIFT OPTR (100%) 616 GREASER; OILER (100%) 728 COMPLETE LOAD /HAUL/DUMP CYCLE (100%)	010 SURFACE MILL (19%) 009 SURFACE MISC (33%) 004 SURFACE MINE (100%)

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APPENDIX K (CONT.)

**TABLE K1, PAGE 2 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**

**MSHA REGULATED CHEMICALS FOUND ON MINE PROPERTY**

**COMMODITY NAME: STONE, DIMENSION, NEC**

CHEMICAL NAME	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(2a) STANDARD DEVIATION	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(5) OCCUPATIONS	(6) LOCATIONS
HYDROGEN CHLORIDE	1	3	2	3	3 GALS	649 ADMN, SUPERVISORY, MGT PERSNL (50%)	009 SURFACE MISC (33%)
PROPANE	16	47	38	42	584,847 GALS	079 CRUSHER OPTR (100%) 579 SLURRY, MIXING OR PUMPING WRKR (100%) 616 GREASER; OILER (100%) 379 DRYER OPTR; KILN OPTR (100%) 604 MECHANIC (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)	006 SURFACE CRUSHING (100%) 010 SURFACE MILL (100%)
SODIUM HYDROXIDE	1	3	2	3	3 GALS	649 ADMN, SUPERVISORY, MGT PERSNL (50%)	009 SURFACE MISC (33%)
TITANIUM DIOXIDE	4	12	10	11	877,270 LBS	579 SLURRY, MIXING OR PUMPING WRKR (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)	010 SURFACE MILL (25%)

**TABLE K2, PAGE 1 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**  
**CHEMICALS FOUND ON MINE PROPERTY THAT HAVE A NIOSH RECOMMENDED EXPOSURE LIMIT**  
**BUT ARE NOT REGULATED BY MSHA**

**COMMODITY NAME: STONE, DIMENSION, NEC**

<b>CHEMICAL NAME</b>	<b>(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)</b>	<b>(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)</b>	<b>(2a) STANDARD DEVIATION</b>	<b>(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)</b>	<b>(4) PREDICTED ANNUAL USAGE</b>	<b>(5) OCCUPATIONS</b>	<b>(6) LOCATIONS</b>
DIESEL FUEL NO. 2	23	92	53	83	311,723 GALS	079 CRUSHER OPTR (100%) 389 FORKLIFT OPTR (100%) 604 MECHANIC (100%) 618 GREASER; OILER (100%) 728 COMPLETE LOAD HAUL/DUMP CYCLE (100%) 379 DRYER OPTR; KILN OPTR (100%) 579 SLURRY, MIXING OR PUMPING WRKR (100%) 616 LABORER; BULLGANG (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (100%)	006 SURFACE CRUSHING (100%) 009 SURFACE MISC (67%) 010 SURFACE MILL (100%) 004 SURFACE MINE (100%)

**TABLE K3, PAGE 1 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**

**CHEMICALS FOUND ON MINE PROPERTY THAT HAVE NO NIOSH RECOMMENDATION OR MSHA EXPOSURE LIMIT**

**COMMODITY NAME: STONE, DIMENSION, NEC**

<b>CHEMICAL NAME</b>	<b>(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)</b>	<b>(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)</b>	<b>(2a) STANDARD DEVIATION</b>	<b>(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)</b>	<b>(4) PREDICTED ANNUAL USAGE</b>	<b>(5) OCCUPATIONS</b>	<b>(6) LOCATIONS</b>
DIATOMITE	10	29	24	26	584,847 LBS	579 SLURRY, MIXING OR PUMPING WRKR (100%) 604 MECHANIC (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)	010 SURFACE MILL (83%)
PHENOLPHTHALEIN	1	3	2	3	3 GALS	649 ADMN, SUPERVISORY, MGT PERSNL (50%)	009 SURFACE MISC (33%)
SILICIC ACID, DISODIUM SALT	10	29	24	26	438,635 LBS	579 SLURRY, MIXING OR PUMPING WRKR (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%) 604 MECHANIC (100%)	010 SURFACE MILL (83%)
THALLO BLUE	3	9	7	8	11,229 LBS	579 SLURRY, MIXING OR PUMPING WRKR (100%)	010 SURFACE MILL (19%)

**TABLE K4, PAGE 1 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**

**TRADE NAME PRODUCTS FOUND ON MINE PROPERTY**

**COMMODITY NAME: STONE, DIMENSION, NEC**

<b>MANUFACTURER'S NAME AND TRADE NAME PRODUCTS</b>	<b>(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)</b>	<b>(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)</b>	<b>(2a) STANDARD DEVIATION</b>	<b>(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)</b>	<b>(4) PREDICTED ANNUAL USAGE</b>	<b>(5) OCCUPATIONS</b>	<b>(6) LOCATIONS</b>
<b>ARC ABRASIVES, INC. AMERICAN WHEEL 24GRIT VITRIFIED GRINDING WHEEL</b>	6	16	14	16	15 LBS	604 MECHANIC (100%)	005 SURFACE SHOP (86%)
<b>BEECHAM, INC. MITEE THREAD CUTTING OIL CLEAR</b>	6	16	14	16	9 GALS	604 MECHANIC (100%)	005 SURFACE SHOP (86%)
<b>BORDEN, INC. KRYLON INTERIOR/EXTERIOR ENAMEL NO 2504 BEIGE (AEROSOL)</b>	6	18	14	16	111 LBS	604 MECHANIC (100%)	005 SURFACE SHOP (86%) 010 SURFACE MILL (38%)
<b>CHAMPION LABORATORIES, INC. PYROIL STARTING FLUID STOCK NO 8-12 (AEROSOL)</b>	1	6	5	6	32 LBS	726 COMPLETE LOAD /HAUL/DUMP CYCLE (100%)	004 SURFACE MINE (17%)
<b>CHEVRON U.S.A., INC. CHEVRON BLOCK GREASE, LD</b>	3	9	7	6	561 LBS	070 CRUSHER OPTR (100%) 618 GREASER; OILER (100%)	006 SURFACE CRUSHING (100%)
<b>DIAMOND SHAMROCK CHEMICAL CO.  LOMAR PW</b>	3	9	7	6	11,897 LBS	379 DRYER OPTR; KILN OPTR (100%)	010 SURFACE MILL (19%)

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APPENDIX K (CONT.)

**TABLE K4, PAGE 2 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**

**TRADE NAME PRODUCTS FOUND ON MINE PROPERTY**

**COMMODITY NAME: STONE, DIMENSION, NEC**

MANUFACTURER'S NAME AND TRADE NAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(2a) STANDARD DEVIATION	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(5) OCCUPATIONS	(6) LOCATIONS
DOW CORNING CORP. DOW CORNING SLY-OFF 22 PAPER COATING  SILICONE RUBBER SEALANT CAT. NO. 732-3	3  9	9  28	7  21	8  24	20,587 LBS  164 GALS	379 DRYER OPTR; KILN OPTR (100%)  379 DRYER OPTR; KILN OPTR (100%) 604 MECHANIC (100%)	010 SURFACE MILL (19%)  010 SURFACE MILL (56%)
GO JO INDUSTRIES, INC. GOJO HAND CLEANER ORIGINAL FORMULA	1	6	5	6	51 LBS	728 COMPLETE LOAD HAUL/DUMP CYCLE (100%)	004 SURFACE MINE (17%)
HEUBACH, INC. HEUBACH AQUIS, HEUCOPHTHAL GREEN	3	9	7	8	14,621 LBS	579 SLURRY, MIXING OR PUMPING WRKR (100%)	010 SURFACE MILL (19%)
LUBRIPLATE LUBRIPLATE SPRAY LUBE 'A' PART NO. 03463 (AEROSOL)	6	18	14	18	155 LBS	604 MECHANIC (100%)	005 SURFACE SHOP (86%) 010 SURFACE MILL (38%)
MPC/DAVIS COLORS OXIDE RED	4	12	10	11	116,969 LBS	579 SLURRY, MIXING OR PUMPING WRKR (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)	010 SURFACE MILL (25%)

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APPENDIX K (CONT.)

**TABLE K4, PAGE 3 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**

**TRADE NAME PRODUCTS FOUND ON MINE PROPERTY**

**COMMODITY NAME: STONE, DIMENSION, NEC**

MANUFACTURER'S NAME AND TRADE NAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(2a) STANDARD DEVIATION	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(5) OCCUPATIONS	(6) LOCATIONS
PFIZER PIGMENTS, INC. SUPERJET LAMPBLACK	3	9	7	8	36,553 LBS	579 SLURRY, MIXING OR PUMPING WRKR (100%)	010 SURFACE MILL (19%)
YELLOW OXIDE	4	12	10	11	116,969 LBS	579 SLURRY, MIXING OR PUMPING WRKR (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)	010 SURFACE MILL (25%)
POST TOOL & SUPPLY CO. FULLER WIRE WHEEL, 10-INCH	6	18	14	16	15 LBS	604 MECHANIC (100%)	005 SURFACE SHOP (86%)
RAMOS OIL CO., INC. LV1-100 OIL	10	29	24	28	146,212 GALS	379 DRYER OPTR; KILN OPTR (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%) 604 MECHANIC (100%)	010 SURFACE MILL (83%)

**TABLE K4, PAGE 4 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**

**TRADE NAME PRODUCTS FOUND ON MINE PROPERTY**

**COMMODITY NAME: STONE, DIMENSION, NEC**

MANUFACTURER'S NAME AND TRADE NAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(2a) STANDARD DEVIATION	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(5) OCCUPATIONS	(6) LOCATIONS
RAMOS OIL CO., INC. SOLVENT, UN1255	10	29	24	26	482 GALS	079 CRUSHER OPTR (100%) 018 GREASER; OILER (100%) 604 MECHANIC (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)	006 SURFACE CRUSHING (100%) 010 SURFACE MILL (44%) 005 SURFACE SHOP (100%)
RELTON CORP. RELTON RAPID TAP CUTTING FLUID	6	18	14	18	3 GALS	604 MECHANIC (100%)	005 SURFACE SHOP (86%)
SHELL OIL CO. ALVANIA GREASE EP 2	12	35	29	32	4,913 LBS	079 CRUSHER OPTR (100%) 604 MECHANIC (100%) 379 DRYER OPTR; KILN OPTR (100%) 018 GREASER; OILER (100%)	005 SURFACE SHOP (86%) 006 SURFACE CRUSHING (100%) 010 SURFACE MILL (63%)
SHELL CRATER 2X FLUID	6	18	14	18	292 GALS	079 CRUSHER OPTR (100%) 018 GREASER; OILER (100%) 379 DRYER OPTR; KILN OPTR (100%)	006 SURFACE SHOP (100%) 010 SURFACE MILL (63%)

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APPENDIX K (CONT.)

**TABLE K4, PAGE 5 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**

**TRADE NAME PRODUCTS FOUND ON MINE PROPERTY**

**COMMODITY NAME: STONE, DIMENSION, NEC**

MANUFACTURER'S NAME AND TRADE NAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(2a) STANDARD DEVIATION	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(5) OCCUPATIONS	(6) LOCATIONS
SHELL OIL CO. SHELL DONAX TD FLUID  TURBO OIL T 150 65608	1  12	3  35	2  29	3  32	439 GALS  5,951 LBS	618 GREASER; OILER (100%)  079 CRUSHER OPTR (100%) 604 MECHANIC (100%) 379 DRYER OPTR; KILN OPTR (100%) 616 GREASER; OILER (100%)	009 SURFACE MISC (33%)  006 SURFACE CRUSHING (100%) 009 SURFACE MISC (33%) 010 SURFACE MILL (63%)
X-100 SAE 30 MOTOR OIL	1	3	2	3	877 GALS	618 GREASER; OILER (100%)	009 SURFACE MISC (33%)
TELEDYNE MCKAY, INC. MCKAY 6013 ELECTRODES	7	20	17	19	439 LBS	604 MECHANIC (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)	010 SURFACE MILL (38%) 005 SURFACE SHOP (100%)

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APPENDIX K (CONT.)

**TABLE K4, PAGE 6 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**

**TRADE NAME PRODUCTS FOUND ON MINE PROPERTY**

**COMMODITY NAME: STONE, DIMENSION, NEC**

MANUFACTURER'S NAME AND TRADE NAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(2a) STANDARD DEVIATION	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(5) OCCUPATIONS	(6) LOCATIONS
TELEDYNE MCKAY, INC. MCKAY 7018XLM ELECTRODES	7	20	17	19	731 LBS	604 MECHANIC (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)	010 SURFACE MILL (38%) 005 SURFACE SHOP (100%)
THE BOC GROUP, INC. EASY-ARC 7018 MR LOW HYDROGEN IRON POWDER ELECTRODES	7	20	17	19	585 LBS	604 MECHANIC (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)	010 SURFACE MILL (38%) 005 SURFACE SHOP (100%)
THE UNITED OIL CO., INC. DURALENE PERMANENT ANTIFREEZE	1	6	5	6	354 LBS	649 ADMN, SUPERVISORY, MGT PERSNL (50%)	009 SURFACE MISC (33%)

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APPENDIX K (CONT.)

**TABLE K4, PAGE 7 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**

**TRADE NAME PRODUCTS FOUND ON MINE PROPERTY**

**COMMODITY NAME: STONE, DIMENSION, NEC**

MANUFACTURER'S NAME AND TRADE NAME PRODUCTS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(2a) STANDARD DEVIATION	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE	(5) OCCUPATIONS	(6) LOCATIONS
THE UNITED OIL CO., INC. SUPER C-3 SAE 10 DURALENE MACK EOK-2 SF-CC-CD  SUPER C-3 SAE 40 DURALENE	2       3	13       19	11       16	12       17	354 GALS       643 GALS	389 FORKLIFT OPTR (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)  389 FORKLIFT OPTR (100%) 728 COMPLETE LOAD HAUL/DUMP CYCLE (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)	004 SURFACE MINE (17%) 009 SURFACE MISC (33%)  009 SURFACE MISC (33%) 004 SURFACE MINE (33%)
WOLF DISTRIBUTORS MAKITA #741402-9AP A24P GRINDING DISC	6	18	14	16	79 LBS	604 MECHANIC (100%)	005 SURFACE SHOP (86%) 010 SURFACE MILL (38%)

**TABLE K5, PAGE 1 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**

**PHYSICAL AGENT CONDITIONS IDENTIFIED ON MINE PROPERTY**

**COMMODITY NAME: STONE, DIMENSION, NEC**

PHYSICAL AGENT CONDITION	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(2a) STANDARD DEVIATION	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE [NOT APPLICABLE]	(5) OCCUPATIONS	(6) LOCATIONS
NOISE	23	92	53	83		079 CRUSHER OPTR (100%) 389 FORKLIFT OPTR (100%) 604 MECHANIC (100%) 618 GREASER; OILER (100%) 728 COMPLETE LOAD HAULDUMP CYCLE (100%) 379 DRYER OPTR; KILN OPTR (100%) 579 SLURRY, MIXING OR PUMPING WRKR (100%) 616 LABORER; BULLGANG (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (100%)	008 SURFACE CRUSHING (100%) 005 SURFACE SHOP (100%) 009 SURFACE MISC (87%) 010 SURFACE MILL (100%) 004 SURFACE MINE (100%)
SEGMENTAL BODY VIBRATION	6	18	14	16		604 MECHANIC (100%)	005 SURFACE SHOP (86%) 010 SURFACE MILL (36%)

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APPENDIX K (CONT.)

**TABLE K5, PAGE 2 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**

**PHYSICAL AGENT CONDITIONS IDENTIFIED ON MINE PROPERTY**

**COMMODITY NAME: STONE, DIMENSION, NEC**

PHYSICAL AGENT CONDITION	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(2a) STANDARD DEVIATION	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE [NOT APPLICABLE]	(5) OCCUPATIONS	(6) LOCATIONS
TEMPERATURE (PROCESS RELATED)	16	47	38	42		079 CRUSHER OPTR (100%) 604 MECHANIC (100%) 618 GREASER; OILER (100%) 379 DRYER OPTR; KILN OPTR (100%) 579 SLURRY, MIXING OR PUMPING WRKR (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)	006 SURFACE CRUSHING (100%) 010 SURFACE MILL (100%)
WHOLE BODY VIBRATION	12	32	29	32		079 CRUSHER OPTR (100%) 604 MECHANIC (100%) 579 SLURRY, MIXING OR PUMPING WRKR (100%) 618 GREASER; OILER (100%)	006 SURFACE CRUSHING (100%) 009 SURFACE MISC (33%) 010 SURFACE MILL (75%)

**TABLE K6, PAGE 1 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**  
**MUSCULOSKELETAL OVERLOAD CONDITIONS IDENTIFIED ON MINE PROPERTY**  
**COMMODITY NAME: STONE, DIMENSION, NEC**

MUSCULOSKELETAL CONDITION	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(2a) STANDARD DEVIATION	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE [NOT APPLICABLE]	(5) OCCUPATIONS	(6) LOCATIONS
AWKWARD LIFTING	10	54	38	49		079 CRUSHER OPTR (100%) 616 LABORER; BULLGANG (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%) 389 FORKLIFT OPTR (100%) 618 GREASER; OILER (100%) 728 COMPLETE LOAD HAUL/DUMP CYCLE (100%)	010 SURFACE MILL (19%) 009 SURFACE MISC (33%) 004 SURFACE MINE (100%)
FINGER AND HANDS	7	35	22	31		079 CRUSHER OPTR (100%) 618 GREASER; OILER (100%) 616 LABORER; BULLGANG (100%)	004 SURFACE MINE (67%) 010 SURFACE MILL (19%)
FREQUENT LIFTING	7	45	37	41		389 FORKLIFT OPTR (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%) 616 LABORER; BULLGANG (100%) 728 COMPLETE LOAD HAUL/DUMP CYCLE (100%)	009 SURFACE MISC (33%) 004 SURFACE MINE (100%)

**TABLE K6, PAGE 2 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**  
**MUSCULOSKELETAL OVERLOAD CONDITIONS IDENTIFIED ON MINE PROPERTY**  
**COMMODITY NAME: STONE, DIMENSION, NEC**

MUSCULOSKELETAL CONDITION	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(2a) STANDARD DEVIATION	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE [NOT APPLICABLE]	(5) OCCUPATIONS	(6) LOCATIONS
HEAVY LIFTING	10	54	37	49		079 CRUSHER OPTR (100%) 389 FORKLIFT OPTR (100%) 618 GREASER; OILER (100%) 728 COMPLETE LOAD /HAUL/DUMP CYCLE (100%) 618 LABORER; BULLGANG (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)	010 SURFACE MILL (19%) 008 SURFACE MISC (33%) 004 SURFACE MINE (100%)
LOWER LIMB	16	61	36	55		079 CRUSHER OPTR (100%) 604 MECHANIC (100%) 618 GREASER; OILER (100%) 379 DRYER OPTR; KILN OPTR (100%) 618 LABORER; BULLGANG (100%)	004 SURFACE MINE (87%) 010 SURFACE MILL (75%)

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APPENDIX K (CONT.)

**TABLE K6, PAGE 3 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**  
**MUSCULOSKELETAL OVERLOAD CONDITIONS IDENTIFIED ON MINE PROPERTY**  
**COMMODITY NAME: STONE, DIMENSION, NEC**

MUSCULOSKELETAL CONDITION	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(2a) STANDARD DEVIATION	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE [NOT APPLICABLE]	(5) OCCUPATIONS	(6) LOCATIONS
NECK AND/OR BACK	12	56	35	51		389 FORKLIFT OPTR (100%) 616 LABORER; BULLGANG (100%) 604 MECHANIC (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)	008 SURFACE MISC (33%) 004 SURFACE MINE (83%) 005 SURFACE SHOP (86%)
WRIST	9	26	21	24		379 DRYER OPTR; KILN OPTR (100%) 604 MECHANIC (100%)	005 SURFACE SHOP (86%) 010 SURFACE MILL (56%)

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APPENDIX K (CONT.)

**TABLE K7, PAGE 1 NOTE: THIS TABLE DOES NOT CONTAIN TRADE SECRET DATA**

**WELDING POTENTIAL EXPOSURES**

**COMMODITY NAME: STONE, DIMENSION, NEC**

WELDING PROCESS	(1) #WORKERS POTENTIALLY EXPOSED (OBSERVED)	(2) #WORKERS POTENTIALLY EXPOSED (PREDICTED)	(2a) STANDARD DEVIATION	(3) %WORKERS POTENTIALLY EXPOSED (PREDICTED)	(4) PREDICTED ANNUAL USAGE [NOT APPLICABLE]	(5) OCCUPATIONS	(6) LOCATIONS
METAL ARC WELDING	7	20	17	19		604 MECHANIC (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)	010 SURFACE MILL (38%) 005 SURFACE SHOP (100%)
OXYFUEL GAS CUTTING	7	20	17	19		604 MECHANIC (100%) 649 ADMN, SUPERVISORY, MGT PERSNL (50%)	010 SURFACE MILL (38%) 005 SURFACE SHOP (100%)

## **APPENDIX L**

### **QUESTIONNAIRE RESULTS**

Since results for all of the 66 NOHSM mineral commodities cannot be conveniently displayed in the analysis section of this appendix, the 66 mineral commodities have been grouped under the 6 mineral industries which MSHA uses in their annual injury experience information reports (with the exception of anthracite and bituminous coal which MSHA combines under the heading coal): stone mining, nonmetallic mineral mining, sand and gravel mining, anthracite coal mining, bituminous coal mining, and metallic mineral mining. Table L1 lists the mineral industry followed by the NOHSM mineral commodities which comprise that particular mineral industry. The NOHSM questionnaire results are presented as the percentage of projected workers who worked at facilities with the given attribute. The sum

of the responses may not total 100% since trade secret data is excluded from this report. The sum of the responses may be greater than 100% since the data is rounded off to the nearest whole number. Any responses that are greater than 0 but less than .5% were reported as <.5%. Additional tables of results (Tables L34 and L36) were provided for questions 40 and 41 which provide the minimum, average, and maximum absenteeism rate in days per employee per year and turnover rate percentage per year (these values were not projected, but based only on the data collected at the surveyed mining facilities). Analysis is provided for questions 10 and 11 to provide an example of how to interpret the following tables of projected results for the questions of the NOHSM questionnaire.

## APPENDIX L (CONT.)

**TABLE L1**  
**MINERAL COMMODITIES THAT COMPRISE EACH MINERAL INDUSTRY**

### STONE MINERAL INDUSTRY

Cement  
Granite (Crushed & Broken)  
Granite (Dimension)  
Lime  
Limestone (Crushed & Broken)  
Limestone (Dimension)  
Marble (Crushed & Broken)  
Marble (Dimension)  
Sandstone (Crushed & Broken)  
Sandstone (Dimension)  
Slate (Crushed & Broken)  
Slate (Dimension)  
Stone (Crushed & Broken, NEC)  
Stone (Dimension)  
Traprock (Crushed & Broken)

### METALLIC MINERAL INDUSTRY

Aluminum  
Beryl  
Copper  
Gold  
Iron Ore  
Lead/Zinc  
Manganese  
Mercury  
Metal Ores, NEC  
Molybdenum  
Platinum Group  
Rare Earths  
Silver  
Titanium  
Uranium  
Uranium - Vanadium Ores  
Vanadium  
Zircon

### SAND & GRAVEL MINERAL INDUSTRY

Sand & Gravel

### NONMETALLIC MINERAL INDUSTRY

Aplite  
Asbestos  
Barite  
Boron Minerals  
Clay  
Feldspar  
Fluorspar  
Gemstones  
Gilsonite  
Gypsum  
Kyanite  
Leonardite  
Lithium  
Magnesite  
Mica  
Nonmetallic, Minerals, NEC  
Oil Shale  
Perlite  
Phosphate Rock  
Pigment Minerals  
Potash  
Pumice  
Pyrites  
Salt (Evaporated)  
Salt (Rock)  
Shale (Common)  
Sodium Compounds  
Talc, Soapstone, & Pyrophyllite  
Trona  
Vermiculite

### ANTHRACITE COAL MINERAL INDUSTRY

Anthracite Coal

### BITUMINOUS COAL MINERAL INDUSTRY

Bituminous Coal

**APPENDIX L (CONT.)**

**Question**

7. Approximately how many years has this facility been involved in any mining or milling activity?

— — — Years (If “unknown” code “998”)

**TABLE L2  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 7 — YEARS OF MINING OR MILLING ACTIVITY**

Mineral Industry	YEARS OF MINING OR MILLING ACTIVITY							UNKNOWN
	0-10	11-20	21-30	31-40	41-50	51-100	>100	
Stone	14%	9%	18%	13%	5%	31%	6%	2%
Nonmetallic	8%	16%	21%	20%	8%	24%	<.5%	<.5%
Metallic	15%	22%	31%	19%	1%	5%	7%	0%
Sand & Gravel	45%	13%	12%	15%	3%	12%	0%	0%
Anthracite	32%	15%	11%	13%	5%	11%	14%	0%
Bituminous	33%	33%	18%	4%	4%	7%	0%	0%
All Mining	25%	23%	20%	10%	5%	14%	2%	1%

## APPENDIX L (CONT.)

### Question

10. Has this facility any formal agreement with the employees concerning occupational health?

- 1 Yes
- 2 No

### Analysis

As can be seen from Table L3, 46 percent of the workers across all mineral industries were covered by a formal agreement concerning occupational health. The metallic and bituminous coal mineral industries had the highest percentages of workers which were covered by a formal agreement concerning occupational health (68% and 56%); while the sand & gravel and stone mining mineral industries had the lowest percentages (34% and 20%).

**TABLE L3**  
**PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE**  
**QUESTION 10 — FORMAL OCCUPATIONAL HEALTH AGREEMENTS**

<b>Mineral Industry</b>	<b>Yes</b>	<b>No</b>
Stone	20%	80%
Nonmetallic	40%	59%
Metallic	68%	30%
Sand & Gravel	34%	66%
Anthracite	37%	63%
Bituminous	56%	44%
All Mining	46%	53%

**APPENDIX L (CONT.)**

**MEDICAL SERVICES**

**Question**

11. Is there a formally established health unit at this facility?

- 1 Yes, physician in charge
- 2 Yes, registered nurse in charge
- 3 Yes, licensed practical nurse in charge
- 4 Yes, other in charge
- 5 No

**Analysis**

Only 16% of the workers across all mineral industries were employed by facilities which had formally established health units, as shown in Table L4. The metallic and nonmetallic mineral industries had the highest percentages of workers which were employed by facilities which had formally established health units (34% and 27%). The metallic minerals industry had the highest percentage of workers which worked for facilities that had formally established health units which were supervised by a physician (17%). The nonmetallic minerals industry had the highest percentage of its workers which were employed by facilities that had health units which were managed by RNs (14%). The anthracite coal and sand & gravel mineral industries had no workers which were employed by facilities that had formally established health units.

**TABLE L4  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 11 — FORMALLY ESTABLISHED HEALTH UNITS**

<b>Mineral Industry</b>	<b>Physician</b>	<b>R N</b>	<b>LPN</b>	<b>Other</b>	<b>None</b>
Stone	0%	2%	0%	4%	93%
Nonmetallic	7%	14%	2%	4%	70%
Metallic	17%	5%	0%	12%	63%
Sand & Gravel	0%	0%	0%	0%	100%
Anthracite	0%	0%	0%	0%	100%
Bituminous	0%	7%	0%	10%	83%
All Mining	3%	6%	<.5%	7%	83%

## APPENDIX L (CONT.)

### Question

12. Do you have on your payroll one or more on-site physicians to give your employees medical care?

- 1 Yes, full-time
- 2 Yes, part-time
- 3 No

**TABLE L5**  
**PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE**  
**QUESTION 12 — MEDICAL CARE BY ON-SITE PHYSICIANS**

<b>Mineral Industry</b>	<b>Full-time Physician</b>	<b>Part-time Physician</b>	<b>No Physician</b>
Stone	0%	2%	96%
Nonmetallic	6%	3%	90%
Metallic	7%	7%	84%
Sand & Gravel	0%	0%	100%
Anthracite	0%	0%	100%
Bituminous	0%	0%	100%
All Mining	1%	2%	97%

**APPENDIX L (CONT.)**

**Question**

13. Do you have a formal arrangement with any outside source (physicians or clinics) to give your employees access to the care of a physician for health-related problems (as opposed to care for traumatic injury)?

- 1 Yes, physician will travel to this facility on call
- 2 Yes, at clinic (not at this facility)
- 3 Yes, physician is based at this facility either full or part-time
- 4 No

**TABLE L6  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 13 — FORMAL ARRANGEMENTS WITH OUTSIDE SOURCE FOR  
PHYSICIAN'S MEDICAL CARE**

<b>Mineral Industry</b>	<b>Physician on Call</b>	<b>Clinic</b>	<b>Facility Physician</b>	<b>None</b>
Stone	2%	46%	2%	49%
Nonmetallic	6%	62%	6%	26%
Metallic	4%	67%	16%	12%
Sand & Gravel	0%	66%	0%	35%
Anthracite	0%	66%	0%	34%
Bituminous	11%	55%	0%	33%
All Mining	7%	56%	3%	33%

**APPENDIX L (CONT.)**

**Question**

14. Estimate the average number of physician hours that are devoted to the care of employees at your facility per week.

\_\_ \_\_ \_\_ hours per week (If "unknown" code "998")

**TABLE L7  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 14 — AVERAGE PHYSICIAN HOURS FOR EMPLOYEES**

<b>AVERAGE PHYSICIAN HOURS FOR EMPLOYEES</b>				
<b>Mineral Industry</b>	<b>0-4</b>	<b>5-10</b>	<b>&gt;=11</b>	<b>UNKNOWN</b>
Stone	59%	3%	0%	37%
Nonmetallic	37%	4%	6%	53%
Metallic	14%	8%	7%	69%
Sand & Gravel	39%	0%	0%	61%
Anthracite	24%	0%	0%	76%
Bituminous	36%	4%	5%	55%
All Mining	38%	4%	4%	53%

**APPENDIX L (CONT.)**

**Question**

15. Does this facility have one or more nurses on the payroll to provide care for employees?

- 1 Yes
- 2 No (Code a "0" in the blank for N/A in question 16)

**TABLE L8**  
**PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE**  
**QUESTION 15 — MEDICAL CARE FROM PAYROLL NURSES**

<b>Mineral Industry</b>	<b>Yes</b>	<b>No</b>
Stone	2%	97%
Nonmetallic	20%	79%
Metallic	31%	67%
Sand & Gravel	0%	100%
Anthracite	0%	100%
Bituminous	8%	92%
All Mining	10%	89%

**APPENDIX L (CONT.)**

**Question**

16. How many registered nurses and licensed practical nurses are on the payroll at this facility, and who provide direct care for your employees?

N/A \_\_\_\_\_

RN \_\_\_\_\_

LPN \_\_\_\_\_

**TABLE L9  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 16 — NUMBER OF NURSES AT FACILITY**

Mineral Industry		NUMBER OF NURSES AT FACILITY			NO NURSE
		1	2	3	
Stone	RN	1%	1%	0%	97%
	LPN	0%	0%	0%	99%
Nonmetallic	RN	15%	3%	0%	82%
	LPN	5%	0%	0%	94%
Metallic	RN	17%	14%	0%	67%
	LPN	0%	1%	7%	90%
Sand & Gravel	RN	0%	0%	0%	100%
	LPN	0%	0%	0%	100%
Anthracite	RN	0%	0%	0%	100%
	LPN	0%	0%	0%	100%
Bituminous	RN	4%	0%	4%	92%
	LPN	4%	0%	0%	96%
All Mining	RN	6%	2%	2%	89%
	LPN	3%	<.5%	1%	96%

**APPENDIX L (CONT.)**

**Question**

17. Estimate the average number of nursing hours that are devoted to the employees of your facility per week.

\_\_ \_\_ \_\_ hours (If "unknown" code "998")

**TABLE L10  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 17 — AVERAGE NURSING HOURS FOR EMPLOYEES**

<b>AVERAGE NURSING HOURS FOR EMPLOYEES</b>				
<b>Mineral Industry</b>	<b>0-4</b>	<b>5-10</b>	<b>&gt;=11</b>	<b>UNKNOWN</b>
Stone	68%	2%	1%	28%
Nonmetallic	33%	2%	19%	45%
Metallic	19%	1%	31%	47%
Sand & Gravel	47%	0%	0%	53%
Anthracite	48%	0%	0%	52%
Bituminous	26%	0%	11%	63%
All Mining	36%	1%	12%	51%

**Question**

18. Do you provide the following examinations or tests to all or to selected groups of employees on a periodic basis?

	<b>No</b>	<b>Yes, All</b>	<b>Yes, All Exec. &amp; Mgmt Only</b>	<b>Yes, All Production Workers Only</b>	<b>Yes, for Selected Mgmt and or Production Workers</b>
Ophthalmology	1	2	3	4	5
Audiometric	1	2	3	4	5
Blood tests	1	2	3	4	5
Urine tests	1	2	3	4	5
Pulmonary function	1	2	3	4	5
Chest X-rays	1	2	3	4	5
Allergy/Sensitization	1	2	3	4	5
Immunizations (flu, etc.)	1	2	3	4	5

**APPENDIX L (CONT.)**

**TABLE L11  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 18 — PROVISION OF MEDICAL TESTS ON A PERIODIC BASIS**

Min. Industry	YES FOR ALL OR SELECTED GROUPS OF EMPLOYEES							
	Ophth.	Audio	Blood	Urine	Pulm.	X-rays	Allergy	Immun.
Stone	24%	44%	18%	21%	22%	24%	1%	9%
Nonmetallic	46%	67%	54%	56%	57%	66%	10%	23%
Metallic	67%	87%	82%	83%	74%	74%	5%	24%
Sand & Gravel	0%	32%	5%	18%	9%	7%	0%	0%
Anthracite	4%	17%	17%	17%	17%	33%	13%	10%
Bituminous	39%	49%	41%	41%	41%	82%	7%	13%
All Mining	37%	53%	40%	42%	40%	62%	6%	14%

NOTE: The abbreviations listed in the table headings stand for: Min. Industry - Mineral Industry; Ophth. - Ophthalmology; Audio - Audiometric; Pulm. - Pulmonary Function; X-rays - Chest X-rays; Allergy - Allergy / Sensitization; and Immun. - Immunizations (flu, etc.).

**Question**

19. Before new employees are hired or placed, are they required to take a medical examination?

1      2      3      4      5

**TABLE L12  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 19 — NEW EMPLOYEE MEDICAL EXAM REQUIREMENTS**

Mineral Industry	Response				
	No	Yes, All	Yes, All Exec. & Mgmt Only	Yes, All Production Workers Only	Yes, for Selected Mgmt and or Production Workers
Stone	27%	64%	0%	1%	7%
Nonmetallic	8%	86%	0%	3%	1%
Metallic	2%	96%	0%	0%	<.5%
Sand & Gravel	57%	43%	0%	0%	0%
Anthracite	66%	30%	0%	4%	0%
Bituminous	4%	96%	0%	0%	0%
All Mining	13%	84%	0%	1%	2%

**APPENDIX L (CONT.)**

**Question**

20. Do you record health information about a new employee on some regular form?

1      2      3      4      5

**TABLE L13  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 20 — NEW EMPLOYEE HEALTH DATA**

<b>Mineral Industry</b>	<b>No</b>	<b>Yes, All</b>	<b>Yes, All Exec. &amp; Mgmt Only</b>	<b>Yes, All Production Workers Only</b>	<b>Yes, for Selected Mgmt and or Production Workers</b>
Stone	16%	80%	0%	2%	2%
Nonmetallic	7%	88%	0%	3%	<5%
Metallic	14%	84%	0%	0%	0%
Sand & Gravel	57%	43%	0%	0%	0%
Anthracite	43%	48%	0%	9%	0%
Bituminous	31%	69%	0%	0%	0%
All Mining	25%	73%	0%	1%	<5%

21. Do you require medical examinations of your employees who return to work after an illness?

1      2      3      4      5

**TABLE L14  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 21 — RETURN TO WORK MEDICAL EXAM REQUIREMENTS**

<b>Mineral Industry</b>	<b>No</b>	<b>Yes, All</b>	<b>Yes, All Exec. &amp; Mgmt Only</b>	<b>Yes, All Production Workers Only</b>	<b>Yes, for Selected Mgmt and or Production Workers</b>
Stone	23%	44%	0%	1%	31%
Nonmetallic	17%	40%	0%	5%	36%
Metallic	6%	50%	0%	2%	41%
Sand & Gravel	25%	41%	0%	0%	34%
Anthracite	40%	37%	0%	20%	4%
Bituminous	19%	56%	0%	4%	22%
All Mining	19%	50%	0%	3%	28%

**APPENDIX L (CONT.)**

**Question**

22. Do you require medical examinations of your employees when their employment is terminated? (Exit examination)

1            2            3            4            5

**TABLE L15  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 22 — TERMINATED EMPLOYEE MEDICAL EXAM REQUIREMENTS**

<b>Mineral Industry</b>	<b>No</b>	<b>Yes, All</b>	<b>Yes, All Exec. &amp; Mgmt Only</b>	<b>Yes, All Production Workers Only</b>	<b>Yes, for Selected Mgmt and or Production Workers</b>
Stone	97%	1%	0%	0%	1%
Nonmetallic	95%	4%	0%	0%	<.5%
Metallic	91%	6%	0%	0%	1%
Sand & Gravel	96%	4%	0%	0%	0%
Anthracite	100%	0%	0%	0%	0%
Bituminous	100%	0%	0%	0%	0%
All Mining	98%	1%	0%	0%	<.5%

## APPENDIX L (CONT.)

### Question

23. How long are medical records and other health information records retained?

— — — Years (If "forever" code "999")  
(If "unknown" code "998")

**TABLE L16**  
**PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE**  
**QUESTION 23 — RETENTION OF HEALTH & MEDICAL RECORDS**

Mineral Industry	<b>#YEARS RECORDS RETAINED</b>				
	0-4	5-10	>=11	UNKNOWN	FOREVER
Stone	10%	10%	3%	24%	53%
Nonmetallic	5%	3%	3%	11%	76%
Metallic	1%	2%	19%	24%	52%
Sand & Gravel	45%	4%	4%	25%	23%
Anthracite	19%	0%	0%	32%	48%
Bituminous	9%	3%	0%	22%	65%
All Mining	10%	5%	3%	22%	60%

## INDUSTRIAL HYGIENE PRACTICES

### Question

24. Has your facility received industrial hygiene services on a consulting basis during the past 12 months?

- 1 Yes, from government sources
- 2 Yes, from non-government sources
- 3 Yes, from both government and non-government sources
- 4 No

**TABLE L17**  
**PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE**  
**QUESTION 24 — INDUSTRIAL HYGIENE SERVICES ON A CONSULTING BASIS**

Mineral Industry	Government	Non-government	Both	None
Stone	5%	17%	3%	74%
Nonmetallic	4%	35%	11%	49%
Metallic	5%	49%	8%	36%
Sand & Gravel	12%	10%	0%	78%
Anthracite	4%	21%	0%	76%
Bituminous	0%	14%	5%	80%
All Mining	3%	21%	5%	70%

**APPENDIX L (CONT.)**

**Question**

25. Do you employ full-time individuals at this facility whose major responsibilities are in the area of **prevention** of illnesses?

- 1 Yes, but not a certified industrial hygienist.
- 2 Yes, a certified industrial hygienist.
- 3 Yes, both certified and non-certified industrial hygienists.
- 4 No (Code a "0" in the blank for N/A in question 26)

**TABLE L18  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 25 — FULL-TIME INDUSTRIAL HYGIENISTS**

<b>Mineral Industry</b>	<b>Non-certified I.H.</b>	<b>Certified I.H.</b>	<b>Both</b>	<b>None</b>
Stone	3%	0%	0%	96%
Nonmetallic	17%	1%	0%	81%
Metallic	31%	3%	3%	62%
Sand & Gravel	0%	0%	0%	100%
Anthracite	0%	0%	0%	100%
Bituminous	16%	0%	0%	84%
All Mining	14%	<.5%	<.5%	85%

**APPENDIX L (CONT.)**

**Question**

26. How many full-time occupational health specialists are employed at this facility?

\_\_\_ \_\_\_ Total

\_\_\_ N/A

For each of those individuals, please write in the appropriate activity number from the activity clusters listed below:

		<b>CLUSTER NO.</b>
Individual #1	___	A: Administers (directs, manages) plans and develops programs, advises top level management.
Individual #2	___	
Individual #3	___	B: Inspects work place to identify hazards, investigates to determine the cause of illnesses.
Individual #4	___	
Individual #5	___	C: Analyzes plans or specs. to identify hazards, develops operating procedures to control hazards.
Individual #6	___	
Individual #7	___	D: Provides education and training.
Individual #8	___	E: Performs and analyzes tests to monitor for the presence of dusts, gases, etc.
Individual #9	___	
Individual #10	___	F: Performs engineering design to control hazards.
Individual #11	___	
Individual #12	___	

**TABLE L19  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 26 — NUMBER OF FULL-TIME INDUSTRIAL HYGIENISTS**

<b>Mineral Industry</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>NO I.H.</b>
Stone	2%	0%	1%	0%	96%
Nonmetallic	12%	5%	2%	0%	81%
Metallic	13%	13%	9%	1%	62%
Sand & Gravel	0%	0%	0%	0%	100%
Anthracite	0%	0%	0%	0%	100%
Bituminous	13%	4%	0%	0%	84%
All Mining	10%	4%	1%	<5%	84%

## APPENDIX L (CONT.)

### Question

27. Do you have a program under which you regularly or periodically monitor the presence of physical agents such as heat, vibration, radiation, noise, or other types of physical agents?

1 Yes (Circle "1" or "2" for each physical agent listed below:)

	Yes	No
1. Heat	1	2
2. Vibration	1	2
3. Radiation	1	2
4. Noise	1	2
5. Other	1	2

2 No (Code a "0" in the blank for N/A in question 28)

**TABLE L20**  
**PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE**  
**QUESTION 27 — MONITORING FOR PHYSICAL AGENTS**

Mineral Industry	Heat	Vibration	Radiation	Noise	Other
Stone	5%	4%	18%	37%	0%
Nonmetallic	12%	6%	38%	78%	5%
Metallic	26%	12%	81%	91%	8%
Sand & Gravel	0%	0%	4%	29%	0%
Anthracite	0%	2%	9%	100%	0%
Bituminous	1%	0%	4%	100%	5%
All Mining	6%	3%	20%	78%	4%

**APPENDIX L (CONT.)**

**Question**

28. How long do you retain the records of the monitoring program?

- \_\_\_ Years (If "forever" code "99")  
 (If "unknown" code "98")  
 \_\_\_ N/A

**TABLE L21  
 PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
 QUESTION 28 — RETENTION OF PHYSICAL AGENT MONITORING RECORDS**

Mineral Industry	#YEARS RECORDS RETAINED					
	0-4	5-10	>=11	UNKNOWN	FOREVER	N/A
Stone	54%	2%	1%	19%	24%	52%
Nonmetallic	23%	<.5%	1%	12%	61%	20%
Metallic	4%	2%	1%	8%	83%	3%
Sand & Gravel	76%	0%	4%	5%	15%	71%
Anthracite	15%	2%	0%	32%	52%	0%
Bituminous	20%	12%	0%	26%	42%	0%
All Mining	29%	7%	1%	19%	43%	18%

**Question**

29. Do you have a program under which you regularly or periodically monitor the health-related presence of fumes, gases, mists, dusts, or vapors?

1 Yes, we have a monitoring program (circle 1 or 2 for each agent listed below)

	Yes	No
1. Fumes	1	2
2. Gases	1	2
3. Mists	1	2
4. Dusts	1	2
5. Vapors	1	2

2 No (Code a "0" in the blank for N/A in questions 30, 31, and 32)

**TABLE L22  
 PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
 QUESTION 29 — AIR MONITORING: AGENT CATEGORIES**

Mineral Industry	Fumes	Gases	Mists	Dust	Vapors
Stone	7%	11%	2%	29%	2%
Nonmetallic	33%	53%	15%	67%	28%
Metallic	78%	83%	52%	82%	69%
Sand & Gravel	4%	4%	4%	21%	4%
Anthracite	0%	4%	0%	70%	0%
Bituminous	0%	36%	4%	82%	5%
All Mining	14%	36%	10%	65%	15%

**APPENDIX L (CONT.)**

**Question**

30. How is this monitoring conducted?

N/A \_\_\_\_\_

- 1 Sample collection with laboratory analysis (Code a "0" in the blank for N/A in question 31)
- 2 Direct-reading instruments
- 3 Both

**TABLE L23  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 30 — AIR MONITORING METHODS**

<b>Mineral Industry</b>	<b>1. Sample Collection Lab/Analysis</b>	<b>2. Direct Read Instruments Only</b>	<b>3. Both 1&amp;2</b>	<b>4. N/A</b>
Stone	16%	6%	11%	66%
Nonmetallic	16%	6%	51%	26%
Metallic	3%	6%	77%	12%
Sand & Gravel	11%	0%	10%	79%
Anthracite	64%	2%	5%	30%
Bituminous	42%	5%	35%	18%
All Mining	27%	5%	35%	32%

NOTE: This question pertains to Question 29 (Table L22).

**APPENDIX L (CONT.)**

**Question**

31. Which types of direct-reading instruments are used in the monitoring program? Circle "1" or "2" for each type listed below:

N/A _____		
	Yes	No
1. Direct mass measurement tests	1	2
2. Fibrous aerosol monitors	1	2
3. Detector tubes	1	2
4. Infrared (I.R.) gas monitors	1	2
5. Ultraviolet (U.V.) gas monitors	1	2
6. Gas chromatograph monitors	1	2
7. Electrochemical monitors	1	2
8. Other "wet" chemical methods	1	2

**TABLE L24**  
**PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE**  
**QUESTION 31 — AIR MONITORING: DIRECT READING INSTRUMENTS**

Mineral Industry	1. Direct Mass Measurement	2. Fibrous Aerosol Monitors	3. Detector Tubes	4. Infrared Gas Monitors
Stone	6%	0%	12%	0%
Nonmetallic	32%	3%	51%	2%
Metallic	49%	12%	81%	2%
Sand & Gravel	2%	0%	10%	0%
Anthracite	3%	0%	4%	4%
Bituminous	31%	0%	38%	0%
All Mining	26%	2%	37%	1%

NOTE: This question pertains to Question 30 (Table L23).

**TABLE L24 (Continued)**  
**PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE**  
**QUESTION 31 — AIR MONITORING: DIRECT READING INSTRUMENTS**

Mineral Industry	5. Ultra-Violet Gas Monitors	6. Gas Chromatograph Monitors	7. Electro-Chemical Monitors	8. Other "Wet" Chemical Methods
Stone	0%	2%	0%	0%
Nonmetallic	3%	2%	16%	10%
Metallic	2%	2%	38%	19%
Sand & Gravel	0%	0%	0%	0%
Anthracite	0%	0%	0%	0%
Bituminous	0%	0%	5%	0%
All Mining	1%	1%	9%	3%

NOTE: This question pertains to Question 30 (Table L23).

**APPENDIX L (CONT.)**

**Question**

32. How long do you retain the records of the monitoring program?

NOTE: DO NOT ASK THIS QUESTION IN COAL MINES.

N/A \_\_\_\_\_

\_\_\_ Years (If "forever" code "99")  
 (If "unknown" code "98")

**TABLE L25  
 PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
 QUESTION 32 — RETENTION OF MONITORING RECORDS FOR:  
 FUMES, GASES, MISTS, DUSTS, AND VAPORS**

Mineral Industry	#YEARS RECORDS RETAINED					
	0-4	5-10	>=11	UNKNOWN	FOREVER	N/A
Stone	70%	2%	1%	10%	15%	66%
Nonmetallic	30%	<.5%	2%	15%	52%	26%
Metallic	16%	2%	1%	8%	72%	12%
Sand & Gravel	81%	0%	4%	9%	6%	79%
Anthracite	15%	2%	0%	6%	77%	0%
Bituminous	6%	0%	0%	0%	94%	0%
All Mining	28%	1%	1%	5%	64%	23%

**APPENDIX L (CONT.)**

**Question**

33. Are there areas in this facility in which personal protective health devices or equipment are required or recommended?

- 1 Yes, required
- 2 Yes, recommended
- 3 Yes, both
- 4 No (Code a "0" in the blank for N/A in questions 34, 35, 36, and 37)

**TABLE L26  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 33 — PERSONAL PROTECTIVE HEALTH EQUIPMENT REQUIREMENTS**

<b>Mineral Industry</b>	<b>Required</b>	<b>Recommended</b>	<b>Both</b>	<b>Not</b>
Stone	19%	11%	68%	1%
Nonmetallic	25%	12%	59%	2%
Metallic	16%	<.5%	82%	<.5%
Sand & Gravel	29%	12%	40%	19%
Anthracite	20%	27%	50%	3%
Bituminous	5%	15%	75%	5%
All Mining	13%	12%	70%	4%

**Question**

34. Who has been designated to see to it that personal protective health devices and equipment are serviced and maintained?

N/A \_\_\_\_\_

- 1 individual employees
- 2 employer representative
- 3 both
- 4 no one
- 5 other, specify \_\_\_\_\_

**TABLE L27  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 34 — PERSONAL PROTECTIVE HEALTH EQUIPMENT RESPONSIBILITY**

<b>Mineral Industry</b>	<b>Employees</b>	<b>Employer</b>	<b>Both</b>	<b>No One</b>	<b>Other</b>	<b>N/A</b>
Stone	21%	17%	46%	13%	1%	1%
Nonmetallic	10%	15%	61%	5%	6%	2%
Metallic	3%	19%	75%	1%	1%	<.5%
Sand & Gravel	9%	24%	34%	14%	0%	19%
Anthracite	13%	37%	29%	18%	0%	3%
Bituminous	20%	21%	44%	9%	0%	5%
All Mining	16%	20%	49%	9%	1%	4%

## APPENDIX L (CONT.)

### Question

35. In those instances where employees refuse to wear protective health devices or fail to wear them properly, are corrective measures taken?

N/A \_\_\_\_\_

- 1 Yes
- 2 No (Code a "0" in the blank for N/A in Questions 36 and 37)

**TABLE L28**  
**PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE**  
**QUESTION 35 — CORRECTIVE MEASURES**

<b>Mineral Industry</b>	<b>N/A</b>	<b>Yes</b>	<b>No</b>
Stone	1%	85%	13%
Nonmetallic	2%	83%	13%
Metallic	<.5%	95%	3%
Sand & Gravel	19%	69%	12%
Anthracite	3%	63%	34%
Bituminous	5%	62%	33%
All Mining	4%	73%	22%

## APPENDIX L (CONT.)

### Question

36. Do those corrective measures involve economic penalties?

N/A \_\_\_\_\_

- 1 Yes
- 2 No (Code a "0" in the blank for N/A in Question 37)

**TABLE L29**  
**PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE**  
**QUESTION 36 — ECONOMIC PENALTIES**

<b>Mineral Industry</b>	<b>N/A</b>	<b>Yes</b>	<b>No</b>
Stone	14%	79%	6%
Nonmetallic	16%	73%	10%
Metallic	3%	94%	1%
Sand & Gravel	31%	65%	4%
Anthracite	37%	63%	0%
Bituminous	38%	55%	7%
All Mining	26%	67%	6%

**APPENDIX L (CONT.)**

**Question**

37. Have any economic penalties been assessed in the past 12 months?

N/A \_\_\_\_\_

- 1 Yes
- 2 No, we know of no instances where violations of company policy have occurred within the last 12 months.
- 3 No, although we know that there was at least one violation of company policy within the last 12 months.

**TABLE L30  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 37 — ECONOMIC PENALTY ASSESSMENT**

<b>Mineral Industry</b>	<b>N/A</b>	<b>Yes</b>	<b>No &amp; no violations known</b>	<b>No &amp; at least one violation</b>
Stone	20%	1%	54%	24%
Nonmetallic	26%	10%	41%	22%
Metallic	4%	19%	38%	37%
Sand & Gravel	35%	4%	39%	22%
Anthracite	37%	2%	57%	4%
Bituminous	45%	0%	35%	20%
All Mining	32%	4%	41%	23%

**APPENDIX L (CONT.)**

**GENERAL RECORDKEEPING AND MISCELLANEOUS INFORMATION**

**Question**

38. How long are personnel records on terminated employees retained?

— — — Years (If "forever", code "999")  
(If "unknown", code "998")

**TABLE L31  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 38 — RETENTION OF RECORDS FOR TERMINATED EMPLOYEES**

Mineral Industry	0-4	#YEARS RECORDS RETAINED			FOREVER
		5-10	>=11	UNKNOWN	
Stone	1%	17%	4%	27%	50%
Nonmetallic	2%	8%	5%	12%	71%
Metallic	1%	16%	5%	11%	65%
Sand & Gravel	6%	12%	0%	41%	40%
Anthracite	2%	0%	0%	17%	81%
Bituminous	7%	4%	0%	20%	69%
All Mining	4%	9%	2%	21%	63%

**Question**

39. Do you keep employee absenteeism records?

- 1 Yes, showing specific nature of illness where appropriate
- 2 Yes, showing only the type of absence
- 3 Yes, without showing the type of absence
- 4 No

**TABLE L32  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 39 — ABSENTEEISM RECORDS**

Min. Industry	Yes-nature of illness	Yes-type absence	Yes-w/o type absence	No
Stone	9%	55%	32%	4%
Nonmetallic	10%	75%	10%	3%
Metallic	12%	85%	<5%	1%
Sand & Gravel	6%	37%	29%	29%
Anthracite	15%	48%	22%	15%
Bituminous	3%	84%	13%	1%
All Mining	6%	74%	16%	4%

**APPENDIX L (CONT.)**

**Question**

40. What is your rate of unscheduled absenteeism?

— — — days per employee per year (If unknown, code "998")

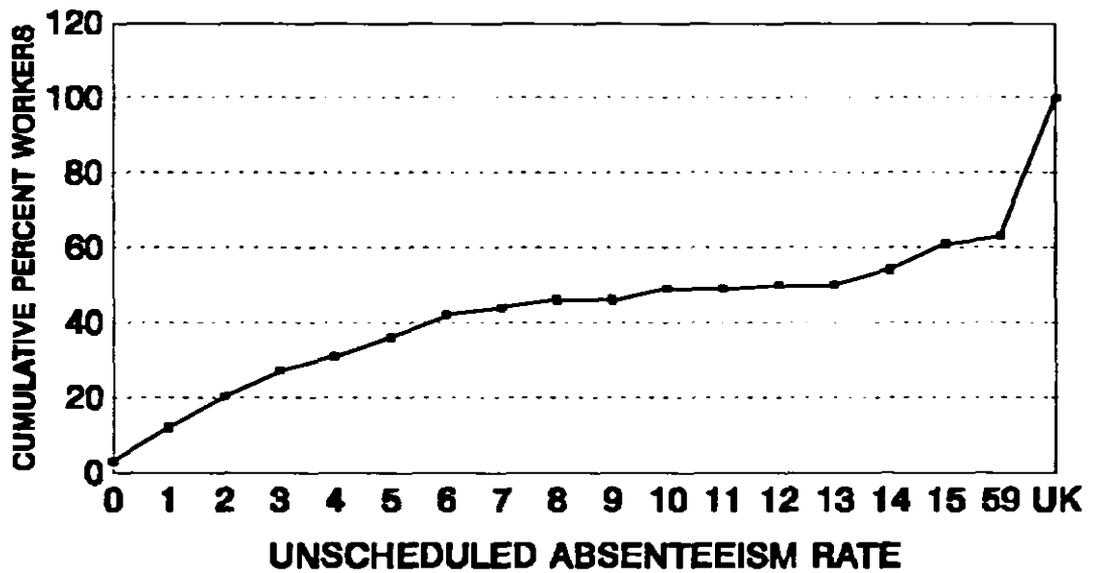
**TABLE L33  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 40 — UNSCHEDULED ABSENTEEISM RATE  
(RESULTS IN RANGES OF DAYS PER EMPLOYEE PER YEAR)**

Mineral Industry	Unscheduled absenteeism (days per employee per year)			
	0-4	5-10	>=11	UNKNOWN
Stone	33%	16%	3%	47%
Nonmetallic	27%	27%	1%	44%
Metallic	44%	24%	5%	24%
Sand & Gravel	37%	10%	0%	53%
Anthracite	45%	14%	11%	30%
Bituminous	28%	15%	27%	30%
All Mining	31%	17%	15%	36%

APPENDIX L (CONT.)

PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 40 — UNSCHEDULED ABSENTEEISM RATE  
(RESULTS IN CUMULATIVE PERCENT OF PROJECTED WORKER'S  
WITH GIVEN ABSENTEEISM RATE)

**FIGURE 6**  
**UNSCHEDULED ABSENTEEISM RATE**  
**(DAYS PER EMPLOYEE PER YEAR)**



UK INCLUDES UNKNOWN RESPONSES  
59 DAYS IS THE MAXIMUM ABSENTEEISM RATE

**APPENDIX L (CONT.)**

**Question**

41. What is your turnover rate among permanent employees in the non-administrative areas?

\_\_ \_\_ \_\_% per year

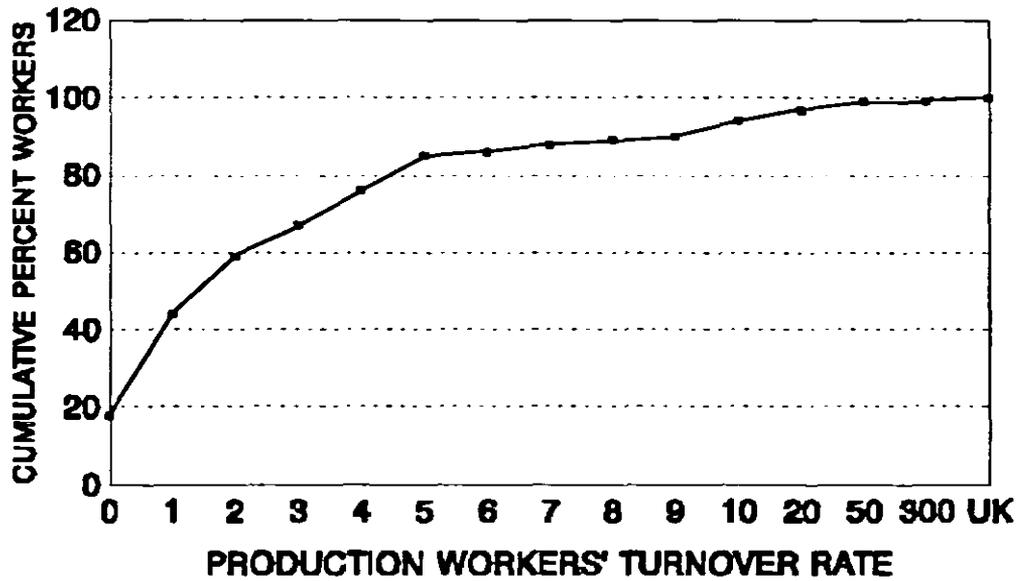
**TABLE L34  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 41 — PRODUCTION WORKER'S TURNOVER RATE  
(RESULTS IN RANGES OF TURNOVER RATE % PER YEAR)**

Mineral Industry	0-4	Turnover Rate % per year		UNKNOWN
		5-10	>=11	
Stone	63%	24%	10%	1%
Nonmetallic	70%	21%	7%	0%
Metallic	61%	25%	12%	0%
Sand & Gravel	40%	42%	17%	0%
Anthracite	56%	31%	13%	0%
Bituminous	91%	9%	0%	0%
All Mining	76%	18%	6%	<.5%

APPENDIX L (CONT.)

PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 41 — PRODUCTION WORKER'S TURNOVER RATE  
(RESULTS IN CUMULATIVE PERCENT OF PROJECTED WORKER'S  
WITH GIVEN TURNOVER RATE)

**FIGURE 7**  
**CUMULATIVE WORKER'S TURNOVER RATE (%/YEAR)**



UK INCLUDES UNKNOWN RESPONSES

300% IS THE MAXIMUM PRODUCTION WORKER'S TURNOVER RATE

**APPENDIX L (CONT.)**

**Question**

42. What year was your personnel record system begun?

Year system begun \_\_\_ \_\_\_ \_\_\_ (If "unknown", code "998")

**TABLE L35  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 42 — YEAR PERSONNEL SYSTEM BEGUN**

Mineral Industry	YEAR PERSONNEL SYSTEM BEGUN						
	<1940	41-50	51-60	61-70	71-80	81-90	UNKNOWN
Stone	11%	6%	12%	8%	11%	20%	31%
Nonmetallic	11%	8%	10%	17%	25%	6%	20%
Metallic	6%	3%	15%	21%	15%	22%	17%
Sand & Gravel	5%	4%	5%	7%	25%	28%	27%
Anthracite	0%	5%	3%	25%	21%	33%	13%
Bituminous	7%	8%	11%	14%	44%	9%	8%
All Mining	8%	7%	11%	14%	30%	14%	16%

**Question**

43. Which of the following items are contained in that system?

- 1 Social security number
- 2 Date of birth
- 3 Date(s) of employment with this facility
- 4 Jobs held at this facility
- 5 Employment history at other facilities
- 6 Sex of worker
- 7 Worker's race
- 8 Worker's home address

**APPENDIX L (CONT.)**

**TABLE L36  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 43 — PERSONNEL SYSTEM ITEMS**

<b>Min. Industry</b>	<b>SSN</b>	<b>Bday</b>	<b>Workdates</b>	<b>Jobs Held</b>	<b>Job history</b>	<b>Sex</b>	<b>Race</b>	<b>Home Add</b>
Stone	99%	99%	99%	89%	73%	90%	57%	99%
Nonmetallic	99%	97%	98%	87%	69%	84%	60%	97%
Metallic	98%	98%	98%	97%	82%	85%	52%	98%
Sand & Gravel	100%	100%	100%	76%	64%	84%	58%	100%
Anthracite	98%	95%	93%	54%	52%	76%	39%	95%
Bituminous	100%	100%	100%	97%	87%	85%	54%	100%
All Mining	99%	99%	99%	92%	80%	86%	55%	99%

NOTE: The abbreviations in the table headings stand for: SSN - Social Security Number; Bday - Birth date; Workdates - Date(s) of employment with this facility; Jobs Held - Jobs held at this facility; Job History - Employment history at other facilities; Sex - Sex of worker; Race - Worker's race; and Home Add - Worker's Home Address.

**Question**

46. If your mine uses diesel equipment in an underground location, when were the first diesel units brought into the mine?

- 1 We use no diesels in the underground locations of this mine.
- 2 We use diesels in underground locations of this mine, and the first diesel was brought into the mine during \_\_\_\_ \_.

(If "unknown" code "998")

**TABLE L37  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 46 — FIRST YEAR DIESELS USED UNDERGROUND**

<b>Mineral Industry</b>	<b>FIRST YEAR DIESELS USED UNDERGROUND</b>						
	<b>1941-50</b>	<b>51-60</b>	<b>61-70</b>	<b>71-80</b>	<b>81-90</b>	<b>UNKNOWN</b>	<b>NONE</b>
Stone	2%	<5%	0%	<5%	0%	3%	93%
Nonmetallic	1%	10%	7%	2%	2%	3%	74%
Metallic	0%	4%	8%	12%	3%	0%	70%
Sand & Gravel	0%	0%	0%	0%	0%	0%	100%
Anthracite	0%	0%	0%	4%	0%	0%	96%
Bituminous	0%	0%	0%	0%	0%	0%	100%
All Mining	<5%	2%	2%	2%	1%	1%	92%

**APPENDIX L (CONT.)**

**Question**

47. Does this facility have any equipment that uses PCB-containing fluids?

- 1 Yes
- 2 No
- 3 Unknown

**TABLE L38  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 47 — EQUIPMENT USING PCB-CONTAINING FLUIDS**

<b>Mineral Industry</b>	<b>Yes</b>	<b>No</b>	<b>Unknown</b>
Stone	42%	49%	8%
Nonmetallic	58%	36%	5%
Metallic	77%	20%	1%
Sand & Gravel	11%	67%	22%
Anthracite	22%	69%	9%
Bituminous	53%	35%	11%
All Mining	51%	39%	10%

**Question**

48. Does this facility rotate shifts, and if so how often?

- 1 Yes, this facility rotates shifts on a \_\_\_\_\_ basis.
- 2 No, this facility does not use shift rotation.

**TABLE L39  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 48 — SHIFT ROTATION**

<b>Mineral Industry</b>	<b>Yes</b>	<b>No</b>
Stone	43%	56%
Nonmetallic	70%	29%
Metallic	91%	7%
Sand & Gravel	5%	95%
Anthracite	28%	72%
Bituminous	41%	59%
All Mining	48%	51%

**APPENDIX L (CONT.)**

**Question**

49. Does this facility have a Labor-Management Health Committee?

- 1 Yes, we have a Labor-Management Health Committee.
- 2 No, we do not have a Labor-Management Health Committee.

**TABLE L40  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 49 — LABOR-MANAGEMENT HEALTH COMMITTEE**

<b>Mineral Industry</b>	<b>Yes</b>	<b>No</b>
Stone	36%	63%
Nonmetallic	41%	58%
Metallic	36%	62%
Sand & Gravel	8%	92%
Anthracite	44%	56%
Bituminous	62%	38%
All Mining	48%	52%

**Question**

51. If you have an assay laboratory, or if you have access to assay reports, then may I have as an example a copy of each unique type of assay report?

- 1 Yes, we have an assay laboratory at this facility, but you may not have a copy of an assay report.
- 2 Yes, we have an assay laboratory at this facility, and you may have a copy of an assay report.
- 3 Yes, you may have a copy of each type of assay report, but we have no assay laboratory at this facility. Our reports come from an off-facility laboratory.
- 4 No, we have no assay laboratory at this facility.

**TABLE L41  
PROJECTED RESULTS BASED ON THE NOHSM QUESTIONNAIRE  
QUESTION 51 — ASSAY REPORTS**

<b>Mineral Industry</b>	<b>Yes lab-No report</b>	<b>Yes lab-Yes report</b>	<b>No lab-Yes report</b>	<b>No lab</b>
Stone	2%	35%	12%	50%
Nonmetallic	6%	37%	17%	35%
Metallic	26%	36%	4%	31%
Sand & Gravel	0%	4%	0%	96%
Anthracite	3%	12%	22%	63%
Bituminous	0%	22%	33%	37%
All Mining	4%	27%	21%	43%

## APPENDIX M

### 100 CHEMICAL SUBSTANCES WITH HIGHEST ANNUAL USAGE RATE (GALLONS)

The usage rate described the amount of each chemical that was used in gallons during the previous 12 months before the NOHSM survey was conducted at the mine. The data in Appendices M and N are mutually exclusive from each other, with some exceptions which are noted with asterisks (\*).

\*NOTE: Chemical also occurs in Appendix N — 100 CHEMICAL SUBSTANCES WITH HIGHEST USAGE RATE (POUNDS).

CHEMICAL NAME	TOTAL VOLUME
*Natural Gas	172,968,803,734,288
Methane	2,078,517,366
*Acetylene	1,174,357,859
Diesel Fuel No. 2	760,940,728
Nitrogen	228,506,181
95% Argon 5% Oxygen	131,690,141
Phosphorus Yellow	63,000,000
Gasoline, Unleaded	37,273,612
Diesel Fuel No. 1	34,479,188
Gasoline, Leaded	30,422,519
Argon	19,874,342
Diesel Fuel No. 6	17,457,797
*Propane	13,542,728
75% Argon 25% Carbon Dioxide	12,105,599
*Hydrogen	11,608,094
*Diesel Fuel No. 5	10,855,195
Waste Fuel	9,948,564
Diesel, Fuel NEC	9,091,754
*Ammonia	7,396,426
Gasoline	6,244,109
*Sulfuric Acid	4,888,132
Liquid Petroleum Gas	4,336,297
#5 Fuel Oil (Reclaim)	4,011,259
*Sodium Hydroxide	3,592,569
Methyl Acetylene-Propadiene Mixture	3,537,100
Diesel Fuel No. 4	3,506,041
*Carbon Dioxide	3,498,558
Kerosene	3,379,431
*Sodium Hydrosulfite	2,195,751
Nitrous Oxide	1,438,576
*Hydrogen Chloride	1,275,638
*Silicic Acid, Disodium Salt	988,108
*Calcium Chloride	723,508
Propylene	548,447
Lignin Sulfite	510,551
Mercury	500,303
Stoddard Solvent	430,291
Ligninsulfonate	401,920
*Chlorine	387,250
Butane	379,108
Burner Fuel	355,466
Magnesium Hydroxide	355,007
Sodium Dimethylnaphthalene Sulfonate	344,935
Helium	315,927
Sulfuric Acid, Monoammonium Salt	283,872
Waste Oil	108,645
Methyl Alcohol	108,315
Magnesium Chloride	81,453
Phosphoric Acid	80,270
Argon 90% Methane 10%	68,923
*Nitric Acid	60,168
Bunker Oil	50,000
Methyl Chloroform	34,593

**APPENDIX M (CONT.)**

<b>CHEMICAL NAME</b>	<b>TOTAL VOLUME</b>
Naphtha, Coal Tar	34,482
Methane, Chlorodifluoro-	34,042
2-Butanone	32,452
Mineral Oil	31,897
Xylene	28,947
Ethylene Glycol	27,360
Diesel No. 2-70%, Kerosene 30%	23,145
Carbon Monoxide	21,497
Hypochlorous Acid, Sodium Salt	20,330
Hydrogen Peroxide	18,904
*Tetrachloroethylene	12,019
Guar Gum	10,398
Diesel Fuel No. 3	10,200
Isopropyl Alcohol	9,507
Argon 75% Helium 25%	8,079
Tallow Amine	7,500
Ethanol	5,004
Diesel Fuel Blend No. 1 And No. 2	5,000
Pine Oil	4,001
Acetic Acid	3,880
Hydrogren Fluoride	3,266
Petroleum White	2,934
Acetone	2,898
Isobutyl Alcohol	2,887
Denatured Alcohol	2,376
Ammonium Hydroxide	2,367
Toluene	2,339
*P. Glycol	2,000
Glycerine	1,872
Boiled Linseed Oil	1,601
Coal Tar Creosote	1,585
Butyl Alcohol	1,452
*Graphite	1,342
Naphtha Gas	1,100
Reagent Alcohol	1,051
Triaryl Phosphate	990
1,2-Propanol	916
Hexone	898
Methane, Dibromo-	874
Oil, Linseed	823
*Chromic Acid and Chromates	775
Acetylene Tetrabromide	710
Metaquat	666
*Methyl Isobutyl Carbinol	625
Al, Aluminum-MF Unknown	605
Potassium Fluoride	577
Bleach	557

## APPENDIX N

### 100 CHEMICAL SUBSTANCES WITH HIGHEST ANNUAL USAGE RATE (POUNDS)

The usage rate described the amount of each chemical that was used in pounds during the previous 12 months before the NOHSM survey was conducted at the mine. The data in Appendices M and N are mutually exclusive from each other, with some exceptions which are noted with asterisks (\*).

\*NOTE: Chemical also occurs in Appendix M — 100 CHEMICAL SUBSTANCES WITH HIGHEST ANNUAL USAGE RATE (GALLONS).

CHEMICAL NAME	TOTAL MASS
Coal	31,596,029,962
Limestone	7,336,988,786
Gypsum	6,689,097,281
Carbonic Acid, Sodium Salt, Monohydrate	2,600,000,028
Carbonic Acid, Sodium Salt (2:3)	2,521,057,195
Alundum	2,416,323,397
Coke	2,369,128,057
Calcium Oxide	2,300,966,324
Glycol Alkaldamine Acetate	1,291,890,214
Silica, Crystalline	1,251,368,386
Coke (Petroleum)	1,173,207,404
Kaolin	1,036,934,250
Ammonium Nitrate	565,323,850
Magnetite	538,391,828
Iron Oxide (Fe <sub>3</sub> O <sub>4</sub> )	452,046,734
Iron Scale	446,522,106
Calcium Hydroxide	433,408,885
Iron Ore	373,109,638
Aluminum Hydroxide (Al (OH) <sub>3</sub> )	358,630,019
Gypsum-Anhydrite Rock	297,754,507
Magnesite	291,718,821
Sodium Phosphate, Primary	240,000,009
*Sulfuric Acid	220,659,158
Bentonite	215,333,732
Shale	203,883,281
Sodium Oxide	203,797,747
Coal Ash	200,000,000
Fe, Iron	189,371,628
Phosphoric Acid, Disodium Salt	189,000,033
Phosphorus Oxide (P <sub>2</sub> O <sub>5</sub> )	143,800,010
Slag	134,861,104
Boron Tribromide	132,000,000
*Sodium Hydroxide	131,366,699
*Hydrogen Chloride	120,764,663
*Chlorine	83,932,375
Carbonic Acid Disodium Salt	76,177,594
Soapstone	54,113,182
*Silicic Acid, Disodium Salt	53,108,354
*Natural Gas	45,215,260
Sodium Cyanide	45,092,950
Aluminum Calcium Oxide	41,280,000
Pyrites	38,400,000
Bauxite	37,611,835
Portland Cement	37,243,329
Chalcopyrite	24,000,000
*Graphite	23,821,564
Iron Salts, Soluble	20,202,021
Creosote Ties	19,093,079
*Ammonia	13,855,875
Zn, Zinc-MF Unknown	13,533,237
Cement	13,144,898
*Calcium Chloride	12,464,945
Copper Slag	10,833,500

**APPENDIX N (CONT.)**

<b>CHEMICAL NAME</b>	<b>TOTAL MASS</b>
*Hydrogen	10,013,469
Iron Pyrite	9,787,558
Wood Dust (Nonallergenic)	8,706,505
Zinc Sulfate	8,299,015
Coal Tar Pitch Volatiles	7,920,293
*Acetylene	7,543,328
Zinc Solution	7,247,339
Diatomite	6,419,202
Sodium Chloride	5,496,595
*Carbon Dioxide	5,353,140
Calcium Hypochlorite	5,133,776
*Methyl Isobutyl Carbinol	5,118,635
Aluminum Sulfate	3,977,420
Oxalic Acid, Disodium Salt	3,706,116
Hydrogen Sulfide	3,656,279
Calcium Carbonate	3,179,706
Silicic Acid, Aluminum Salt, Hydrate	3,019,847
Pearl Starch	2,970,001
Silicon Carbide	2,796,597
Ferrinox Sic	2,275,511
Masonry Cement, Type N	2,240,422
*Nitric Acid	2,192,182
Titanium Dioxide	2,011,168
Sodium Chlorate	1,989,075
Sodium D-Gluconate	1,980,751
Sulfuric Acid Copper(2+) Salt (1:1)	1,763,178
Sulfur Dioxide	1,743,161
Carbon	1,521,591
Metaphosphoric Acid, Hexasodium Salt	1,416,009
Copper Solution	1,348,800
Sulfur	1,306,252
Starch	1,259,581
*Diesel Fuel No. 5	1,208,471
*Tetrachloroethylene	1,204,819
Iron Oxide (Fe <sub>2</sub> O <sub>3</sub> )	1,203,704
Feldspar	1,151,027
Lead Nitrate	1,145,444
Al, Aluminum-MF Unknown	1,130,773
*Propane	1,104,142
*Sodium Hydrosulfite	1,079,839
Kyanite	1,027,140
Ammonium Chloride	1,000,410
*Chromic Acid and Chromates	993,775
*Propylene Glycol	946,872
Ferrate(4-), Hexacyano-, Tetrasodium	935,038
Sulfuric Acid, Iron(2+) Salt (1:1)	901,988
Carbonic Acid, Dithio, O-Pentyl Ester, Potassium Salt	860,732

## APPENDIX O

### 100 CHEMICAL SUBSTANCES WITH THE HIGHEST PROJECTED NUMBER OF WORKERS POTENTIALLY EXPOSED

This appendix lists the 100 chemical substances with the highest projected number of workers potentially exposed and the standard deviations for these projections. It is beyond the scope of this report to provide the projections and standard deviations for all of the data gathered by NOHSM. However, any parties that are interested in the projections and standard deviations for specific agents of interest should direct their requests to the NOHSM project officer listed in the discussion section IX of this report, or obtain the NOHSM database that is described in the NOHSM database section VI of this report and perform the calculations themselves. The number of workers that were potentially exposed to chemical substances contained in the ore being mined is not reported in this appendix. This appendix only reports those chemical substances which were purchased and then used at the mining facility. Hence, coal miners are not listed as being potentially exposed to coal, asbestos miners are not reported as being potentially exposed to asbestos, and so forth.

\*NOTE: The number of projected workers potentially exposed to these mineral chemicals in this appendix does not include the number of workers employed in the corresponding mineral commodities listed in Appendix P.

CHEMICAL NAME	NUMBER OF PROJECTED WORKERS POTENTIALLY EXPOSED	STANDARD DEVIATION
Diesel Fuel No. 2	109,097	12,945
Acetylene	66,665	9,795
Gasoline, Unleaded	30,811	5,240
Gasoline, Leaded	19,893	4,668
Diesel Fuel No. 1	16,852	6,046
Propane	11,437	2,594
*Coal	11,193	2,010
Kerosene	10,712	2,412
Calcium Chloride	10,513	5,331
*Limestone	8,918	4,268
75% Argon 25% Carbon Dioxide	8,493	5,531
Natural Gas	8,040	1,546
*Gypsum	6,701	1,747
95% Argon 5% Oxygen	5,516	5,423
Sulfuric Acid	4,626	870
Hydrogen Chloride	4,578	407
Sodium Hydroxide	4,567	909
Methyl Chloroform	4,412	3,620
Ammonium Nitrate	4,333	3,553
Stoddard Solvent	4,307	2,275
Calcium Oxide	4,252	1,430
Nitrogen	4,042	2,122
Gasoline	3,901	2,280
Naphtha, Coal Tar	3,227	1,421
Petroleum White	3,110	3,058
Xylene	2,994	2,771
Carbonic Acid Disodium Salt	2,729	542
Magnetite	2,668	1,029
Diesel Fuel, Nec	2,664	1,206
Silica, Crystalline	2,620	981
Aluminum Sulfate	2,527	2,284
Iron Oxide (Fe <sub>3</sub> O <sub>4</sub> )	2,423	1,108
Calcium Hydroxide	2,411	933
Carbon Dioxide	2,054	572

**APPENDIX O (CONT.)**

<b>CHEMICAL NAME</b>	<b>NUMBER OF PROJECTED WORKERS POTENTIALLY EXPOSED</b>	<b>STANDARD DEVIATION</b>
Calcium Sulfate	2,025	1,795
Coke (Petroleum)	1,887	1,068
Ligninsulfonate	1,719	1,690
Argon	1,587	461
Mineral Oil	1,563	763
Coke	1,561	751
Chloroprene	1,558	1,296
Methyl Alcohol	1,504	531
Iron Scale	1,455	843
Carbonic Acid Monosodium Salt	1,454	559
Ammonium Hydroxide	1,452	384
Graphite	1,420	514
*Iron Ore	1,410	753
Nitric Acid	1,245	194
Methyl Acetylene-Propadiene Mixture	1,215	657
Dichlorodifluoromethane	1,178	653
Denatured Alcohol	1,091	585
Carbonic Acid, Dithio, O-Pentyl Ester, Potassium Salt	1,084	912
Fe, Iron	1,079	517
Silicic Acid, Disodium Salt	1,067	686
Acetic Acid	1,066	240
Sodium Cyanide	1,063	210
Methyl Isobutyl Carbinol	1,039	754
Acetone	1,013	235
*Portland Cement	1,002	564
Phenolphthalein	974	184
Liquid Petroleum Gas	956	381
Stearic Acid, Calcium Salt	940	770
Diatomite	900	292
Bauxite	899	524
Tetrachloreethylene	881	618
Cholorine	797	330
Chromic Acid and Chromates	737	171
Barium (Soluble Compounds)	726	165
Phosphoric Acid	723	189
Creosote Ties	716	704
Potassium Iodide	709	159
Methane, Dibromo-	646	593
Silver Nitrate	641	161
Ethanol	639	253
Ammonia	635	227
Tin	594	166
Potassium Nitrate	590	409
Alundum	586	186
Iron Salts, Soluble	576	344
Magnesium Chloride	574	474
Sulfuric Acid, Cobalt(2+) Salt (1:1)	552	340
Glycerine	539	154
Calcoi, Fluoride	534	402
Potassium Permanganate	529	160
Isopropyl Alcohol	508	160
Sodium Oxide	499	408
Coal Tar Pitch Volatiles	494	340
Mg, Magnesium-MF Unknown	492	401
Al, Aluminum-MF Unknown	487	401
Bentonite	478	288
Hydrogen Fluoride	478	147
Copper Slag	462	0
Sodium Chloride	462	101

**APPENDIX O (CONT.)**

<b>CHEMICAL NAME</b>	<b>NUMBER OF PROJECTED WORKERS POTENTIALLY EXPOSED</b>	<b>STANDARD DEVIATION</b>
Sulfamic Acid	458	259
Diesel Fuel No. 6	456	281
Boric Acid	442	103
Ammonium Chloride	433	146
Zn, Zinc-MF Unknown	433	144
*Asbestos	429	193
Magnesite	421	400

**APPENDIX P**  
**NUMBER OF WORKERS EMPLOYED IN EACH COMMODITY**  
**AT THE TIME THE NOHSM SURVEY WAS CONDUCTED**

<b>COMMODITY</b>	<b>WORKERS EMPLOYED-SURVEY</b>
Aluminum	3,801
Anthracite Coal	2,299
Aplite	32
Asbestos	444
Barite	429
Beryl	121
Bituminous Coal	133,079
Boron Minerals	1,344
Cement	7,404
Clay	10,055
Copper	10,517
Feldspar	392
Fluorspar	137
Gemstones	80
Gilsonite	142
Gold	4,290
Granite (Crushed & Broken)	5,322
Granite (Dimension)	1,005
Gypsum	1,170
Iron Ore	4,245
Kyanite	113
Lead/Zinc	1,869
Leonardite	52
Lime	2,949
Limestone (Crushed & Broken)	32,769
Limestone (Dimension)	571
Lithium	170
Magnesite	157
Manganese	102
Marble (Crushed & Broken)	467
Marble (Dimension)	98
Mercury	59
Metal Ores, NEC	35
Mica	340
Molybdenum	835
Nonmetallic Minerals, NEC	2,546
Oil Shale	155
Perlite	244
Phosphate Rock	5,463
Pigment Minerals	29
Platium Group	372
Potash	1,712
Pumice	143
Pyrites	13
Rare Earths	218
Salt (Evaporated)	330
Salt (Rock)	1,768
Sand and Gravel	16,782
Sandstone (Crushed & Broken)	2,278
Sandstone (Dimension)	338
Shale (Common)	620
Silver	2,739
Slate (Crushed & Broken)	206
Slate (Dimension)	373
Sodium Compounds	2,256
Stone, Crushed & Broken, NEC	2,031
Stone, Dimension, NEC	111
Talc, Soapstone & Pyrophyllite	830
Titanium	374
Traprock (Crushed & Broken)	2,518
Trona	749

**APPENDIX P (CONT.)**

<b>COMMODITY</b>	<b>WORKERS EMPLOYED-SURVEY</b>
Uranium	1,179
Uranium - Vanadium Ores	45
Vanadium	229
Vermiculite	277
Zircon	29

**APPENDIX Q**  
**100 TRADE NAME PRODUCTS WITH THE HIGHEST PROJECTED NUMBER OF**  
**WORKERS POTENTIALLY EXPOSED**

<b>TRADE NAME PRODUCT</b>	<b>MANUFACTURER OR DISTRIBUTOR</b>	<b>NUMBER OF PROJECTED WORKERS POTENTIALLY EXPOSED</b>
Coal Mine Rock Dust	White's Stone Co.	33,024
WD-40 Item 42110 (Aerosol)	The WD-40 Company	22,866
Atom Arc Type 7018	Chemtron Corp.	12,919
Lan-Lin Hand Cleaner Part No. M10-75	Radiator Chemical Corp.	11,396
Hydraulic Fluid 100A ISO VG 100	Century Hulburt, Inc.	11,207
Permatex Form-A-Gasket No. 2 Sealant, #80011	Loctite Corp.	11,126
Lincoln Jetweld LH-70 Electrode, E7018, 7016	Lincoln Electric Co.	10,880
Texaco Multifak EP-2	Texaco Incorporated	10,399
Texaco ATF Dexron Two	Texaco Incorporated	9,770
Hobart 718 LMP Class E7018 Stock No. S116051-35 Prod. No. 90379E	Hobart Brothers Company	9,610
447A Covered Electrodes E6013	Hobart Brothers Company	9,549
Arcair Copperclad Pointed Electrodes Type D.C. Cat. No. 22 033 003	Air Products & Chemicals, Inc.	9,410
Whisk Bio-degradable Waterless Hand Cleaner Stock No. U2WW White	The Metalife Company	8,224
CRC Electrical Grade Lectra Clean, #02018 (Aerosol)	CRC Chemical Inc.	8,180
Safety-Kleen 105/140 Solvent-Combustible Liquid UN1255	Safety Clean Corp.	8,096
Super Prime Pentolite 12-25	International Minerals & Chemical Corporation	7,905
Linde Gouging Electrodes DC. CC. 1/4" X 12" Part No. 7012F04	Sierra Welding Supply Co.	7,840
Gulf Crown Grease EP 2	Gulf Oil Corp.	7,316
None! Primadet	Ensign-Bickford Co.	7,164
Rainbow Anti-Fog And Lens Cleaner	Lensclean Inc.	7,136
Conoco Super-Sta Grease Stock No. 9030	Conoco, Inc.	7,084

**APPENDIX Q (CONT.)**

<b>TRADE NAME PRODUCT</b>	<b>MANUFACTURER OR DISTRIBUTOR</b>	<b>NUMBER OF PROJECTED WORKERS POTENTIALLY EXPOSED</b>
CRC Electrical Grade 2-26, #02005 (AEROSOL)	CRC Chemical Inc.	6,742
HA 30 Sand	Woodstock Trucking Company	6,514
Shopcoat Primer Red Oxide E6 1RC21	The Sherwin-Williams Company	6,397
Waterless Hand Cleaner 602	Safety Clean Corp.	6,255
Union Special #68 Hydraulic Oil	Union Oil Co. Of California	6,239
Exxon Spartan EP 320	Exxon Corp.	6,227
Copperclad	Air Products & Chemicals, Inc.	6,227
Linde Union Carbide Linde Hi-Dep Alloy 82 AWS/ASME-SFA5.18 ER70S-3	Union Carbide Corporation	6,156
Oil-Dri All Purpose Absorbent	Oil-Dri Corp. Of America	6,150
Texaco Meropa 220 Code 2321	Texaco Incorporated	6,126
Atom-Arc 8018 Electrodes Class E-8018-C3	Chemtron Corp.	6,109
Brill*Tex Spec. GP 27 A24R 7*	Federal-Mogul Corp.	6,047
Low Silica Mine Safety Dust	E. Dillon and Company	6,045
Weld-Aid Nozzle-Kleen Number 2 Anti-Spatter Spray Non-Silicone Stock No.007022 (Aerosol)	Weld-Aid Products, Inc.	6,023
Atom-Arc 8018N AWS Class E-8018-C2 HT L81129 LOT D425C4AF	Chemtron Corp.	5,944
Permatex Anti-Seize Lubricant Part No. 133K Item No. 80078	Loctite Corp.	5,934
Jetweld LH-70 7018	Lincoln Electric Co.	5,907
Fleetweld 35 Electrodes E6011	Lincoln Electric Co.	5,905
Atom Arc 9018 Electrodes	Chemtron Corp.	5,757
Texaco Marfak Multi Purpose 2	Texaco Incorporated	5,740
Lincoln Fleetweld 5P Electrode, E6010	Lincoln Electric Co.	5,735
Certanium 889 Machinable Cast Iron Maintenance Electrode	Certanium Alloys & Research Co.	5,682
Conoco Fleet 30W Motor Oil	Conoco, Inc.	5,627

**APPENDIX Q (CONT.)**

<b>TRADE NAME PRODUCT</b>	<b>MANUFACTURER OR DISTRIBUTOR</b>	<b>NUMBER OF PROJECTED WORKERS POTENTIALLY EXPOSED</b>
CRC Electrical/Electronic Grade CO Contact Cleaner Precision Cleaner Solvent No. 02016 (Aerosol)	CRC Chemical Inc.	5,597
Lube-Matic Welding Wire Lubricant & Cleaner Part No. 007040	Weld-Aid Products, Inc.	5,585
Type SW Welding Electrodes E6013	Westinghouse Electric Corp.	5,533
Nozzle-Dip Gel Anti-Spatter Gel 007094	Weld-Aid Products, Inc.	5,526
Chevron Dura-Lith Grease EP-2	Chevron U.S.A., Inc.	5,523
Certanium 705 Electrode	Certanium Alloys & Research Co.	5,521
Cincinnati Milacron Grinding Wheel Spec. 5C461-K6-VSC 1P-287A 94179-1QC	Cincinnati Milacron Co.	5,516
Dual Shield Continuous Flux Cored Electrode Type Coreweld 70 E70T-1 STK. NO. 24-341002-4	Chemtron Corp.	5,516
Atom Arc Type 9018CM Class E9018-B3	Chemtron Corp.	5,516
Conoco EP Conolith Grease No. 1	Conoco, Inc.	5,433
Nickel Anti-Seize Lubricant Part No. 80755	Loctite Corp.	5,343
Bay State Abrasives Dresser Readymount Scotsman 9"X1/4" SCT 110R 7H827743B	Augusta Tool & Specialty Co.	5,322
SBS 30 Waterless Skin Cleaner	SBS Products, Inc.	5,300
Mistic Metal Mover A Cutting Fluid And Penetrant	Mistic Metal Mover, Inc.	5,288
M30 With The Hand Cream Base Stock # 0-4004	Martin Laboratories, Inc.	5,283
Grind-O-Flex Flapper Discs ALO Resin Grit 120 CCN 521002	Merit Abrasive Products, Inc.	5,223
Anti-Seize Lubricant Part No. 80209	Loctite Corp.	5,164
Thermatex EP 2	Mobil Oil Corp.	5,050
Lincoln Fleetweld 37 Electrodes, E6013	Lincoln Electric Co.	4,933
7M7260 Liquid Gasket Material	Caterpillar Tractor Co.	4,933

**APPENDIX Q (CONT.)**

<b>TRADE NAME PRODUCT</b>	<b>MANUFACTURER OR DISTRIBUTOR</b>	<b>NUMBER OF PROJECTED WORKERS POTENTIALLY EXPOSED</b>
Liquid Wrench Part No. L1-12 (Aerosol)	Radiator Chemical Corp.	4,933
Exxon Lidok EP 2	Exxon Corp.	4,787
Ursa Super Plus Sae 30 Product Code 2112	Texaco Incorporated	4,662
Heavy Duty Equipment Cleaner	East Kentucky Chemical, Inc.	4,620
Gopher Grinding Disc Grade A24GP	Ansari Abrasive Manufacturing	4,607
Wagner Dot 3 Motor Vehicle Brake Fluid 21B	McGraw-Edison Co.	4,585
Fas Loc Resin Cartridges 441 0B 0305	E.I. Du Pont De Nemours & Co. (Inc.)	4,580
Rock Dust	Abshire Trucking Co.	4,537
Super Hydraulic Oil 68 Product Code 7450	Conoco, Inc.	4,506
Dowtherm 209 Coolant	The Dow Chemical Company And Subsidiaries	4,420
Go-Jo Hand Cleaner Creme Type Stock No. 1111	Go Jo Industries, Inc.	4,350
Quintolubric 822 220 Fire Resistant Hydraulic Fluid	Quaker Chemical Corp.	4,309
Wick Climb	B & B Chemical Co., Inc.	4,176
Moreplex Moly NLGI 2 Lubricating Grease	Century Hulburt, Inc.	4,153
Caterpillar Cement, #5H2471	Caterpillar Tractor Co.	4,129
Molub-Alloy 936 Light Open Gear Compound	Imperial Oil & Grease Company, Inc.	4,120
Safety-Kleen Parts Cleaner 105/140	Safety Clean Corp.	4,092
Spartan EP 680 5376	Exxon Corp.	4,032
Unocal Unoba EP Grease 2	Union Oil Co. Of California	4,027
DCL 2 SAE 30 CD/SF Diesel Engine Oil	Century Hulburt, Inc.	4,022
Lubricating Grease 1643 20	Century Hulburt, Inc.	3,991
Century Oils Moreplex 2 Lubricating Grease	Century Hulburt, Inc.	3,930

**APPENDIX Q (CONT.)**

<b>TRADE NAME PRODUCT</b>	<b>MANUFACTURER OR DISTRIBUTOR</b>	<b>NUMBER OF PROJECTED WORKERS POTENTIALLY EXPOSED</b>
Solder Seal/Gunk Dot 3 Super Heavy Duty Brake Fluid, #M44-34	Radiator Chemical Corp.	3,879
Diesel Fuel No. 2 (Winter Blend With 5% Kerosine)	Ashland Oil Co., Inc.	3,837
Chevron Ultra-Duty Grease 2	Chevron U.S.A., Inc.	3,814
Unoba EP-2 Grease	Union Oil Co. Of California	3,786
No. FDD1455 Dustallay	Wen-Don Corp.	3,775
Plasti-Cote Super Enamel Spray Paint T-9 Yellow	Plasti-Kote Co., Inc.	3,710
Rockdust	Benwood Limestone	3,707
Dixon Railroad Crayon 888 Red	Dixon Ticonderoga Co.	3,698
Mobil Delvac 1230 Motor Oil SAE 30	Mobil Oil Corp.	3,696
Conoco Automatic Transmission Fluid Type F	Conoco, Inc.	3,689
Unax Sped. Hyd. 315	Union Oil Co. of California	3,687
Three-M-Ite Elek-Tro-Cut Cloth Utility Roll	3M Company	3,661
Dupont Tovex Water Gel Blasting Agent, N.O.S.	E.I. Du Pont De Nemours & Co. (Inc.)	3,660
Jesco Lubricants DS-OG-WC-0 Summer 10	Jesco Lubricants, Co., Inc.	3,634

## APPENDIX R

### 100 PRODUCT USE TERMS (PUTs) WITH THE HIGHEST PROJECTED NUMBER OF WORKERS POTENTIALLY EXPOSED

PRODUCT USE TERM	NUMBER OF PROJECTED WORKERS POTENTIALLY EXPOSED
Fuel	165,178
Grease	113,470
Cleaner, Hand	89,357
Oil, Hydraulic	87,291
Oil, Motor	78,640
Welding Rod	65,903
Lubricant, NEC	60,571
Solvent	56,131
Penetrant	55,840
Compound, Dust Control	48,855
Cleaner, Glass	40,691
Paint	39,742
Oil, Gear	39,331
Fluid, Transmission	38,239
Abrasive, Grinding	37,020
Sealant	28,837
Fluid, Brake	26,537
Shielding Gas	24,446
Absorbent	24,350
Fluid, Starting NEC	21,941
Lubricant, Gear	21,588
Cleaner, Electrical Contact	20,434
Compound, Anti-Seize	20,352
Adhesive	20,204
Remover, Grease	20,142
Antifreeze, Radiator	18,510
Primer	18,493
Explosive, Detonator NEC	18,335
Oil, NEC	16,749
Welding, Wire	16,320
Cleaner, NEC	15,046
Explosive, Lead Lines	12,784
Gouging Electrode	11,896
Fire Retardant	11,852
Explosive, Detonator Code	11,752
Agent, Blasting	11,745
Fluid, Hydraulic	11,666
Fluid, Cutting	10,738
Antifreeze, NEC	10,727
Cleaner, Metal	10,459
Cutting Rod	10,274
Additive, NEC	9,990
Agent, Anti-Splattering	9,692
Additive Fuel	9,631
Sand	9,325
Thinner	8,815
Abrasive, Blasting	8,763
Lubricant, Open Gear	8,708
Cement, NEC	8,420
Gasket, Liquid	8,227
Chalk	8,060

**APPENDIX R (CONT.)**

<b>PRODUCT USE TERM</b>	<b>NUMBER OF PROJECTED WORKERS POTENTIALLY EXPOSED</b>
Oil, Cutting	7,857
Oil, Lube	7,832
Belt Dressing	7,603
Antifreeze, Airline	7,409
Sand Paper	7,272
Cleaner, General	6,573
Compound, Gasket	6,451
Compound, Water Treatment	6,356
Resin	6,073
Chemical, NEC	6,045
Gasket Material	5,930
Explosive, Boosters	5,780
Brazing Rod	5,536
Compound, Packing	5,320
Additive, Chemical Process	5,199
Emulsifier	5,192
Flocculant	5,074
Compound, Pipe Thread	5,055
Oil, Compressor	4,835
Cement, Masonry	4,795
Agent, Wetting	4,778
Remover, Moisture	4,549
Deicer	4,412
Compound, Sweeping	4,350
Plaster	4,279
Brake Equipment	4,230
Reagent, Flotation	4,130
Coolant	3,984
Compound, Steam Cleaning	3,954
Oil, Penetrating	3,787
Repellent, Insect	3,696
Remover, Gasket	3,602
Frother	3,564
Insulation	3,488
Raw Material	3,430
Soldering Rod	3,388
Antifreeze, Windshield	3,318
Brush, Wire	3,273
Cleaner, Floor	3,266
Fluid, Torque	3,239
Lubricant, Cable	3,189
Filler, NEC	3,180
Fluid, Layout	3,089
Inhibitor	3,039
Wood	2,986
Pip	2,985
Cleaner, Automotive	2,905
Indicator	2,769
Cutting Wheel	2,735