

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

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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

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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

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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

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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

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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

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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).

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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

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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

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- 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)

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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**

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

**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

028	Scoop-Tram Operator	035	Continuous Miner Helper
	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.
029	Mucking Machine Operator	036	Continuous Miner Operator
	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).
030	Slusher Operator	037	Cutting Machine Helper
	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.
032	Brattice Man	038	Cutting Machine Operator
	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.
034	Diamond Drill Operator	039	Hand Loader (Load Only)
	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.
		041	Jacksetter
			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.
		043	Gathering Arm Loader Operator
			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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379	Dryer Operator; Kiln Operator		for loading and unloading purposes on the surface.
	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).	399	Dimension Stone Cutter and Polisher; Rock Sawyer
385	Lampman		One who saws or cuts stone to specific dimensions. One who smoothes the surface of stone such as granite or marble.
	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.	413	Janitor
			One who keeps the premises of a mine site clean by removing waste and refuse.
387	Rotary Bucket Excavator Operator	416	Salvage Crew
	One who operates mobile loading equipment with rotary buckets.		One who recovers timber, rails, steel arches, pipes, etc. from abandoned workings and prevents wastage in the use of materials.
388	Scalper-Screen Operator	420	Aerial Tram Operator
	One who operates a coarse primary screen or grizzly which passes ore size of a certain maximum dimension.		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.
389	Forklift Operator	434	Churn Drill Operator
	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.		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.
392	Toplander; Skip Dumper; Tipple Operator	456	Engineer (Electrical, Ventilation, Mining, Etc.); Technical Services
	One on the surface who receives and unloads vehicles loaded with rock and ore.		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
393	Weighman; Scale Man		
	One who determines the weight of ore or rock by use of a scale.		
394	Carpenter		
	One who is skilled in building or repairing wooden structures.		
397	Yard Engine Operator		
	The operator of a locomotive which moves ore or rock carrying rail cars		

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<p>transport electricity to mining equipment.</p>	<p>of materials; for example, the feed to a filter press or other filtration equipment).</p>
<p>479 Hydrating Plant Operator</p> <p>A worker who operates a plant where a mineral is combined with water, forming a hydroxide. An example product is hydrated lime.</p>	<p>588 Sizing and Washing Operations Worker</p> <p>A worker who operates equipment that sizes and washes ore by the use of screens and water.</p>
<p>488 Dry Screening Plant Operator</p> <p>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.</p>	<p>601 Conveyor Belt Crew</p> <p>One who sets up and tends conveyor belts used to transport material at a mine. Also called beltman; conveyor beltman.</p>
<p>513 Building Repair and Maintenance</p> <p>One who repairs and maintains the buildings associated with a mine.</p>	<p>602 Electrician</p> <p>A specialist skilled in electricity who maintains electrical equipment in a mine.</p>
<p>514 Laboratory Technician</p> <p>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.</p>	<p>603 Electrician Helper</p> <p>One who assists or aids the electrician.</p>
<p>516 Tamping Machine Operator</p> <p>A person who operates a machine that compacts base material around rail ties in order to lay or realign track.</p>	<p>604 Mechanic</p> <p>One skilled in repairing mining equipment.</p>
<p>534 Jackleg or Stoper Drill Operator</p> <p>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.</p>	<p>607 Jackhammer Operator; Chipping Hammer Operator</p> <p>JACKHAMMER OPERATOR—One who operates a percussive type of automatically rotated rock drill that is worked by compressed air. Bit pressure is manually applied. CHIPPING HAMMER OPERATOR—One who operates a percussive type rock drill that is worked by compressed air. Bit pressure is manually applied.</p>
<p>579 Slurry, Mixing or Pumping Operations Worker</p> <p>A person who prepares and regulates the flow of a slurry (a thin watery suspension</p>	<p>608 Mason</p> <p>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.</p>
<p></p>	<p>609 Supply Man; Nipper</p> <p>A person who delivers supplies to miners.</p>

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|------------|---|------------|---|
| 612 | Belt Vulcanizer

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. |
| 613 | Cleanup Man

One who collects and loads spillage resulting from normal operations. | 623 | Surveyor; Transit Man

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. |
| 614 | Sampler; Dust Sampler

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. | 634 | Rotary (Electric or Hydraulic) Drill Operator

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. |
| 616 | Laborer; Bullgang

General workers not otherwise classified. | 649 | Administrative, Supervisory, Management Personnel

One who superintends, guides, or directs workers at a mine or assists in such activity. |
| 618 | Greaser; Oiler

A workman responsible for keeping machinery properly lubricated. Also called grease monkey. | 660 | Machinist

One who is skilled in the use of metal working tools. |
| 619 | Welder (Welding, Cutting, Brazing, Hard Surfacing, Soldering)

One who completes the following tasks:
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. | 663 | Shaft Miner; Shaft Sinking

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.) |
| 622 | Dump Operator

One who controls the loading of ore or rock at the end of a conveyor or the | 668 | Tractor Operator

One who drives a gasoline or diesel-driven machine with tracks or pneumatic tires in order to pull or push other vehicles. |
| 622 | Dump Operator

One who controls the loading of ore or rock at the end of a conveyor or the | 669 | Bin Puller; Truck Loader

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; Gunitite Man**
One who sprays cement mortar (gunitite 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 gunitite 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

001 Slushing	The loading of broken rock or ore with the use of a scraper bucket pulled forward and backward with cables.	007 Blasting	The operation of breaking ore or rock by using an explosive charge. Also called shot firing.
002 Machine Mucking	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.	008 Rock Sawing	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.
003 Hand Mucking	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.	009 Drilling, Percussive	A form of drilling in which the rock is penetrated by the repeated impact of a reciprocating drill tool.
004 Timbering	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.	010 Drilling, Rotary	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.
005 Rock Bolting	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.	011 Drilling, Diamond	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.
006 Back Filling	The filling in of a place with waste material from which the rock or ore has been removed.	012 Loading, Hauling, Dumping —Electrical Equipment	LOADING—Maneuvering material removed from the mining process into trucks, mine cars, conveyors etc. by electrical equipment. HAULING—The transporting of the product of the mine from the working places by electrical equipment. DUMPING—Unloading material taken from a mine by electrical equipment. ELECTRICAL EQUIPMENT—Equipment powered by electricity.
		013 Loading, Hauling, Dumping —Diesel Equipment	LOADING—Maneuvering material removed from the mining process into

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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.

APPENDIX H (CONT.)

- 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	109 Electrician
Operations that involve the installation and maintenance of tracks in the haulage roads of the mine where track haulage is being used.	The operation of installing, maintaining, and repairing the electrical equipment of a mine.
102 Concrete Operations	110 Ventilation
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.	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.
103 General Shop Work	111 Scaling
Any operation in a shop which is not otherwise classified. Does not include welding, mechanic, and electrician.	The operation of prying loose stone from the roof.
104 Welding	112 Salvage Operations
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.	Recovering timber, rails, steel arches, pipes, etc. from abandoned workings.
105 Mechanic	113 Lubrication
Activities that involve the repairing and assemblage of machines.	The operation of oiling or greasing machinery.
106 Supply Handling	114 Battery Station Operation
Receiving, storing, and providing equipment, spare parts, and other materials necessary to the operation of the mine.	Charging and exchanging batteries used in a mine.
107 Technical Services	115 Road Grading
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.	Operating a machine to level mine roads.
108 Administration	116 Lamp Operations
The act of supervising and managing the work of miners throughout the complete mining cycle.	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

001	Underground Mine 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.
002	Underground Shop Locations beneath the surface of the earth in an underground mine where equipment is repaired and maintained.	007	Surface Grinding 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.
003	Underground Mill Locations beneath the surface of the earth in an underground mine where ore or rock is crushed, ground, or otherwise processed.	008	Surface Flotation and Reagents Locations above the surface of the earth where mineral separation occurs by chemical means.
004	Surface Mine Locations above the surface of the earth where minerals or metals are extracted.	009	Surface Miscellaneous Locations above the surface of the earth not otherwise classified.
005	Surface Shop Locations above the surface of the earth where equipment is repaired and maintained.	010	Surface Mill Locations above the surface of the earth where rock or ore is processed. Excludes crushing, grinding, and flotation and reagents locations.
006	Surface Crushing Locations above the surface of the earth where rock or ore is		