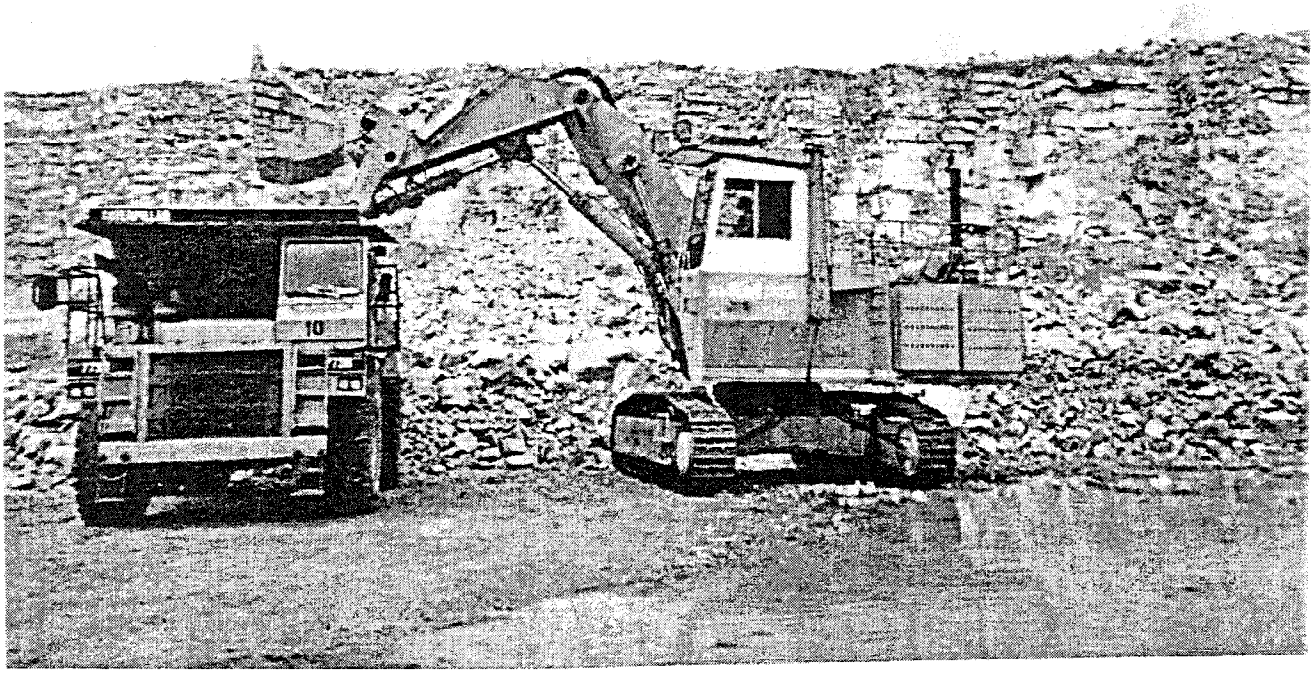
MODULE NUMBER 8
OF
INSTRUCTION GUIDE NUMBER 43

ON-THE-JOB TRAINING MODULES
FOR
SURFACE METAL AND NONMETAL MINES

POWER SHOVEL OPERATION



This module describes the basic job steps, potential hazards or accidents, and recommended safe job procedures for power shovel operation.

Power shovels are used at surface metal and nonmetal mines for overburden removal and for ore loading. Many different sizes of shovels may be used, depending on the type of operation and application.

Accidents relating to shovel operation most often result from slips and falls, becoming caught in or struck by moving mechanisms, and standing or walking near the machine while it is in operation.

Slips and falls occur most often during maintenance, repair, or cleanup, and when mounting and dismounting the machine. Miners are most often struck by moving mechanisms during greasing or oiling, or when performing maintenance or repair. Injuries to persons standing or walking near the machine often occur when the person is in the area and the shovel operator is unaware of their location.

The basic job steps included in this module are:

1. Conduct walk-around inspection of shovel and work area.
2. Mount and dismount.
3. Conduct on-board inspection.
4. General operation.
5. Shutdown procedure.
6. Perform repairs and maintenance.

Several of these procedures apply to the oiler and groundman as well as the shovel operator.

The operator's manual provided with the machine, and the mine's operating procedures, should also be used in training machine operators.

The following safe job procedures will help minimize incidents which may cause injuries and adversely affect production:

Required and/or recommended personal protective equipment:

Hard hat, safety shoes, safety glasses with side shields, gloves, clothing appropriate for weather conditions, hearing protection where needed

SEQUENCE OF BASIC JOB STEPS	POTENTIAL ACCIDENTS OR HAZARDS	RECOMMENDED SAFE JOB PROCEDURES
1. Conduct walk-around inspection of shovel and work area.	1. A) Personal injury, unsafe equipment or work area.	1. A) Visually inspect machine and work location for defective equipment and/or unsafe conditions prior to operation. Report any unsafe conditions to your supervisor and correct all defects.
	B) Electrocution.	B) Visually inspect trailing cable for cuts, abrasions, and other damage (electric power shovels). If inspection requires handling the cable, power must be off at switch house, or proper protective equipment (insulated hooks, tongs, ropes, or slings) must be used.
	C) Rock fall. Striking personnel, or damaging machinery with shovel.	C) Inspect highwall, spoil and pit conditions in your work area. Know traffic patterns, and communicate with fellow workers before operating shovel. Warning signs are recommended to prohibit unauthorized persons from coming near the shovel.

SEQUENCE OF BASIC JOB STEPS	POTENTIAL ACCIDENTS OR HAZARDS	RECOMMENDED SAFE JOB PROCEDURES
1. (Continued)	D) Falling material, improper operation.	D) Inspect bucket dipper teeth and adapters for tightness. Inspect latch bar for wear and proper adjustment.
	E) Slips and falls.	E) Be especially careful of ruts, uneven ground, and frozen ground. Make sure all steps, ladders, handrails, handholds, and walkways are in good condition and free from oil, grease, mud, snow, and ice.
	F) Machine damage, rope failure. NOTE: IG 43 Module 14, contains detailed procedures for inspecting wire rope and related items.	F) Check for oil leaks, gear wear, seized bearings, loose or damaged crawlers or rollers, lubrication of gears and rollers. Check ropes and boom structural strands (to the extent possible).
	G) Splashed fluids, burns.	G) Check fluid levels. Wear safety glasses with side shields and gloves. Remove tank caps or covers carefully. It is important to know if gear cases are hot or cold.
2. Mounting and dismounting.	2. A) Slips, falls, caught between shovel and other machine.	2. A) Use caution when mounting or dismounting. Do not get on or off until the operator is notified.
	B) Struck by or thrown from ladder.	B) Do not get on or off while the shovel is in motion.

SEQUENCE OF BASIC JOB STEPS	POTENTIAL ACCIDENTS OR HAZARDS	RECOMMENDED SAFE JOB PROCEDURES
2. (Continued)	C) Slips and falls.	C) Use steps, ladders, handholds, etc., provided for mounting and make sure they are in good condition. Keep both hands free for climbing.
	D) Rock fall, caught between shovel and other machines.	D) Never walk or stand between the shovel and the bank, highwall, spoil, or other nearby machines while mounting.
	E) Clothing caught on control levers or other projections, slips and falls.	E) Wear snug fitting clothing and keep boots, steps, ladders, etc., free from oil, grease, mud, etc. NOTE: Slip resistant flooring is recommended in walkway zones.
	F) Ladder failure.	F) Raise boarding ladder (if provided) and be sure it is secured.
3. Conduct on-board inspection.	3. A) Equipment movement and/or failure, stuck or inoperative controls, poor visibility.	3. A) Check operator's cab. Make sure all controls are in the neutral position, brakes set, and bucket lowered to the ground. Make sure cab is free from debris, etc., and windows clean.
	B) Caught in, or struck by, moving parts.	B) Make sure all guards and safety devices are in place and in good condition.

SEQUENCE OF BASIC JOB STEPS	POTENTIAL ACCIDENTS OR HAZARDS	RECOMMENDED SAFE JOB PROCEDURES
3. (Continued)	C) Slips, trips, falls, fire hazard.	C) Check decks and house area for uncovered openings, slipping, or tripping hazards, and accumulations of flammable or combustible material or liquids. Practice good housekeeping.
	D) Fire hazard.	D) Know location and operation of fire extinguishers, and make sure they are fully charged and operable. Don't smoke or use open flame sources around combustible or flammable liquids or materials.
	E) Fire and/or explosion hazard.	E) Keep all compressed gas cylinder tanks secured, and keep covers in place. Keep all compressed gas cylinders, hoses, torches, and regulators free of grease and oil. Do not store this equipment in the same enclosed area where flammable or combustible liquids are stored.
	F) Electrocution, burns, equipment failure.	F) Be sure all electrical equipment (switches, breakers, controls, panels, guarding, etc.) is in proper operating position and in good condition. Never perform any electrical work or enter any energized electrical panels or cabinets unless you are a qualified electrician. Be sure to lock out and tag the equipment or circuit.

SEQUENCE OF BASIC JOB STEPS	POTENTIAL ACCIDENTS OR HAZARDS	RECOMMENDED SAFE JOB PROCEDURES
3. (Continued)	G) Boom or gantry failure, rope failure caused by sheave failure, excessive rope wear.	G) Inspect boom, boom pockets, and gantry for cracks, breaks, structural damage, excessive wear, missing parts, etc. Check point sheaves and saddle blocks for damage or excessive wear.
	H) Rope failure.	H) Check both the running ropes and the boom structural strands for broken strands and loose sockets. Periodic nondestructive testing of sockets is recommended.
	I) Trips and falls.	I) Check all steps, ladders, handrails, platforms, and walkways for cracks, corrosion, damage, or any deterioration.
	J) Potential hazards that remain uncorrected.	J) Report and, if possible, repair any defects or hazards found during walk-around or on-board inspections. Do not use machine with safety defects. If the shovel is unsafe and removed from service, tag it to prohibit further use until repairs are completed.

SEQUENCE OF BASIC JOB STEPS	POTENTIAL ACCIDENTS OR HAZARDS	RECOMMENDED SAFE JOB PROCEDURES
4. General operation.	4. A) Striking or catching other personnel.	4. A) Sound an audible horn prior to starting shovel in motion, after repairs or after being idle.
	B) Personal injury due to lack of communication.	B) By visual observation or verbal communication, make certain machine crew (oiler/ groundman) and all other persons and machines are clear before starting. Be sure the machine crew reports to you throughout the shift, so that you have a general idea of where they are at all times.
	C) Machine or control malfunction.	C) Make sure air pressure is at proper operating range. Check out motions of machine and all controls, limits, and warning devices. Check all brake systems. Stop machine if you feel or see any unusual response or hear any abnormal sounds.
	D) Personal injury, inefficient operation.	D) Clearly understand any work assignment before starting. Make certain machine crew and others know and understand all signals.
	E) Unsecured raised equipment, injury from sudden machine movement when power is restored, equipment damage.	E) In the event of a power failure, move all brake switches to set position, place other controls in the neutral position, and secure the machine's position until power is restored.

SEQUENCE OF BASIC JOB STEPS	POTENTIAL ACCIDENTS OR HAZARDS	RECOMMENDED SAFE JOB PROCEDURES
4. (Continued)	F) Personal injury, machine damage.	F) When operating and/or moving shovel, be alert for pit elevations, highwall, spoil, trenches, faults, clearances, traffic, machine crew, other workers, sump holes, and trailing cables. Keep shovel on good sound footing.
	G) Injury or equipment damage from fall of material.	G) Never swing bucket over workers, vehicles, machines, or trailing cable. When loading haulers, don't swing over cab. Be sure of clearance over hauler bed and position bucket before tripping.
	H) Equipment damage, overturning.	H) Never suddenly set brakes while swinging, except in an emergency. Avoid jerking and abrupt motions.
	I) Fall of material and/or bucket.	I) Do not suspend a loaded or empty bucket in the air, with the brakes set, for long time periods. Lower to ground when not in use.
	J) Ground failure, rock fall.	J) Observe condition of highwall and spoil banks at all times. When freezing, thawing, rain, etc., have created a potential highwall or spoil bank failure condition, immediately notify crew, others working in the area, and your supervisor. Use machine's audible alarm signal to warn personnel of this immediate danger if necessary.

SEQUENCE OF BASIC JOB STEPS	POTENTIAL ACCIDENTS OR HAZARDS	RECOMMENDED SAFE JOB PROCEDURES
4. (Continued)	K) Ground failure, rock fall. NOTE: IG 43, Module 15, contains more information on ground control.	K) Loose hazardous material must be stripped for a safe distance (10 feet or more) from the top of pit or quarry walls, and loose unconsolidated material must be sloped to the angle of repose. Leave highwall as safe as possible before moving up.
	L) Cab struck by rolling material, machine damage.	L) When dumping to a higher level, be alert for rocks or material rolling down the bank, especially when cab is beside the bank.
	M) Striking other machines/ vehicles with falling material or machine.	M) After being notified, allow sufficient time for vehicles or machines to pass by shovel before resuming normal operations.
	N) Fall of material.	N) Do not work between machines and the highwall or spoil bank where your escape from falls or slides may be hindered.
	O) Electrocution, burns, cable damage, strains and overexertion.	O) Protect trailing cable from damage. Never carry or move cable with bucket unless slings are used. If energized cable must be moved manually, use proper protective equipment (insulated hooks, tongs, ropes, or slings). Keep kinks, twists, and short bends out of trailing cable. Don't pull long lengths at one time. Take several loops to minimize strain on cable. Don't run over power cables.

SEQUENCE OF BASIC JOB STEPS	POTENTIAL ACCIDENTS OR HAZARDS	RECOMMENDED SAFE JOB PROCEDURES
4. (Continued)	P) Electrocution, burns, machine damage.	P) Never work or swing boom within a minimum distance of 10 feet from any energized overhead power line.
5. Shutdown procedure.	5. A) Personal injury, equipment damage.	5. A) Park shovel on firm ground in a position where it does not create a traffic hazard and is not subject to damage by slides or falling material.
	B) Fall of equipment, machine damage.	B) Place bucket on ground firmly and release cable tension.
	C) Injury or equipment damage if machine moves when energized.	C) Place all controls in proper position. Make sure all brake controls are in the set position.
	D) Personal injury.	D) Do not permit anyone to get on or off the shovel while it is in motion unless equipped to do so safely.
	E) Slips, trips, falls, caught between ladder and other machine or obstruction.	E) Dismount shovel (see Job Step No. 2).
	F) Hazards due to lack of communication.	F) Communicate with fellow employees and supervisor at end of shift. Notify of any hazardous conditions, machine malfunctions, etc.

SEQUENCE OF BASIC JOB STEPS	POTENTIAL ACCIDENTS OR HAZARDS	RECOMMENDED SAFE JOB PROCEDURES
6. Performing repairs and maintenance (if applicable).	6. A) Personal injury from improper procedure.	6. A) Do not attempt repairs or maintenance you do not understand and have not been trained to do.
	B) Caught by, or struck by, moving or falling parts, or moving machine.	B) Do not lubricate any moving part unless guarding, and extended fittings, prevent access to hazardous moving parts. Do not attempt any repairs or maintenance until the power is off, the machinery is locked out and tagged and blocked against motion, and all raised equipment lowered. If necessary to perform work on top of, under, around, or from a raised piece of equipment, block or mechanically secure the equipment to prevent accidental rolling, falling, or lowering.
	C) Fall of person.	C) Don't climb boom or gantry while shovel is in motion. Use safety belts with lanyards in elevated positions outside work platform, or where there is a danger of falling.
	D) Fall of hoisted loads or equipment.	D) Do not overload hoisting or lifting device. On hoisted materials that require steadying and guidance, use taglines.
	E) Personal injury.	E) Plan any work to be done and maintain good communications. Know and observe safe work practices. Inspect tools and maintain in good condition.

GENERAL INFORMATION

This module is part of an Instruction Guide that was developed to assist the surface metal and nonmetal mining industry in conducting effective on-the-job training (OJT) of new employees, or employees reassigned to different jobs. The use of training materials, such as this module, is an important part of an effective, systematic, OJT program.

This Instruction Guide uses a generic Job Safety Analysis (JSA) of jobs common to the industry. The JSA format facilitates uniform basic training in safe job procedures, while requiring only a minimum of time and effort on the part of the trainer. This material is generic to the industry; therefore, each company using this guide will need to tailor the material somewhat to fit their particular requirements. In some cases, the material must be general in nature, and will not include specific details of procedures or equipment that must be taught by the trainer.

Recommendations for an overall OJT program are contained in the Mine Safety and Health Administration (MSHA) guide: "Structuring Effective On-The-Job Training Programs," June, 1983.

TRAINING RECOMMENDATIONS

On-the-job training is usually best done by the employee's immediate supervisor. If the supervisor relies on another employee to do certain parts of the training, the supervisor should be present to monitor the training. OJT is conducted at the actual job site where the work will be done.

The supervisor/trainer should use the training materials (this module, or other materials) while the training is being done, to help ensure that all job steps are covered, and that no important safety precautions are omitted. Effective OJT should begin with an explanation (lecture and/or discussion) of the safe job procedure. The explanation should be followed by a hands-on demonstration of the proper job procedure. A good demonstration is, perhaps, the most important part of OJT. The demonstration is followed by supervised practice, during which the supervisor/trainer coaches (corrects and encourages) the employee, and evaluates when the employee is ready to do the job without direct supervision.

The first step – explaining the job to the employee – can be done in different ways. The supervisor/trainer and the employee can sit down and go through the training materials together. It may be advantageous to provide the employee with a copy of the training modules that are applicable to his/her job. The fact that most of the training is conducted at the job site does not preclude the use of a classroom or a quiet office for the first part of the training. Any general theory or knowledge training, as well as the initial explanation of the job procedure, may be best done in an office/classroom setting; especially when noise levels, or other conditions at the job site, make communication difficult. A complete series of job steps could be presented through the use of slides developed at the mining operation.