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ABSTRACT

This training outline for shovel operators, one in a series of eight outlines, is designed primarily for company training foremen or supervisors and for trainers to use as an industry-wide guideline for heavy equipment operator training in open pit mining in British Columbia. Intended as a guide for preparation of lesson plans both for classroom and on-the-job training activities, this outline is divided into eight modules. Each module is based on 3 to 14 objectives. For each objective, key points and procedures are outlined. Module topics are basic safety and operating rules, communications, indicators and controls, pre-start and operational checks, basic operation, shovel production, lubrication and service, and special assignments. A skill profile chart is attached. (YLB)

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OPEN PIT MINING JOB TRAINING SERIES

SHOVEL OPERATOR

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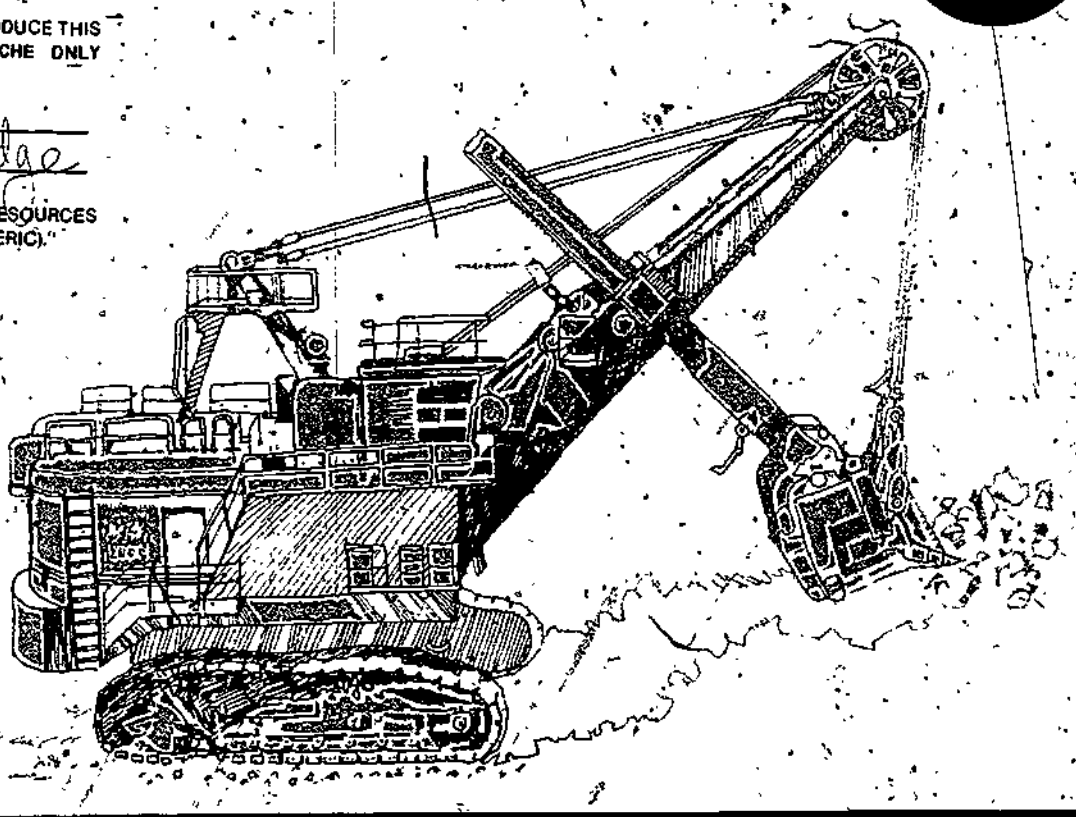

Titles in the Open Pit Mining Job Training Series

- Haulage Truck Operator
- Rubber Tire Dozer Operator
- Track Dozer Operator
- Front End Loader Operator
- Grader Operator
- Rotary Drill Operator
- Shovel Operator
- Heavy Duty Tireman

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OPEN PIT MINING
JOB TRAINING SERIES
SHOVEL OPERATOR

A joint project
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member companies of the
Mining Association of British Columbia

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INTRODUCTION

The *Open Pit Mining Job Training Series* was developed through the co-operation of member companies of the Mining Association of British Columbia and the Post-Secondary Department of the Ministry of Education. The series was initiated by the education and training committee of the Mining Association. The committee chairman, Les Redford, has given invaluable support throughout the project.

The training outlines in the series are primarily written for company training foremen or supervisors and for trainers to serve as an industry-wide guideline for heavy equipment operator training in open pit mining in British Columbia.

THE DEVELOPMENT PROCESS

DACUM

Each of the training outlines in the series was developed using the DACUM process, a systematic model for developing modular training programs. A series of four booklets describing the DACUM process is available from:

Publication Services Branch,
Ministry of Education,
878 Viewfield Road,
Esquimalt, B.C.
V9A 4V1
Telephone: (604) 387-5331

Project Initiation

The Mining Association's education and training committee gave early direction to the project. Committee members actively working with chairman Les Redford were:

Bill Scribner, Brenda Mines Limited
Bill Dement, Craigmont Mines Limited
Tom Nicholson, Mining Association of British Columbia
Glen Martin, Similkameen Division, Newmont Mines Limited

Vic Dawson of the Ministry of Energy, Mines and Petroleum Resources also participated with the committee in setting directions.

The first workshop with representatives from the mining industry, the Mining Association, and the Ministry of Education was held in April, 1979. Project goals and priorities were set and an activity plan was established.

DACUM Workshop and Skill Profile Charts

A three day DACUM workshop was held in June 1979. This workshop was conducted by Diane Morrison, a program developer from the Ministry of Education. The following representatives participated in the workshop:

Fred Mason, Afton Mines Limited
Ivan Moser, Afton Mines Limited
Bill Savilow, B.C. Coal Ltd.
Vern Bouck, Bethlehem Copper Corporation
Ray Chenier, Bethlehem Copper Corporation
Bill Scribner, Brenda Mines Limited
Ron Owens, Cyprus Anvil Mining Corporation
Dennis LeDuc, Endako Mines Division, Placer Development Limited
Terry Perrier, Fording Coal Limited
Barry Tripp, Granisle Mine, Noranda Mines Limited
Tom Nicholson, Mining Association of British Columbia
Fred Savage, Ministry of Education

Jack Murray, Noranda Mines Limited

Ed Rudolph, Noranda Mines Limited

Don Rankin, Similkameen Division, Newmont Mines Limited

Don Barker, Zapata Granby Limited

The DACUM workshop produced heavy equipment operator skill profile charts. Each chart listed the essential skills needed by the operator on the job. During the following months, the skill profile charts were circulated to representatives throughout the mining industry for validation.

Training Outlines

Once the skill profile charts were approved, the next step was to write training outlines. For each skill on the charts, one or more objectives were written that state what the trainee must be able to perform at the end of the training program to demonstrate mastering the skill. A trainee who can do all the objectives in the outlines is considered to have the skills required to perform on the job. A training outline developed using this approach is often referred to as a performance or competency-based outline.

Bill Savilow from B.C. Coal Ltd. (formerly Kaiser Resources) was selected to write six training outlines from the skill profile charts. He worked part-time on the outlines while continuing his responsibilites in the training department at B.C. Coal. Bill wrote the *Haulage Truck Operator, Rubber Tire Dozer Operator, Track Dozer Operator, Front-End Loader Operator, Grader Operator* and *Rotary Drill Operator* outlines during 1980 and 1981.

Don McColman of Newmont Mines wrote *Heavy Duty Tireman* and Larry Hartley of Utah Mines wrote *Shovel Operator*.

Bruce Kurschenska of B.C. Coal Ltd. supplied the photographs upon which the cover illustrations are based.

Reviewing the Training Outlines

Throughout 1980 and 1981 a series of workshops were held to review the outlines. The workshops were conducted by Diane Morrison and attended by participants from various mining companies. The participants who played an extremely important role in examining and revising the training outlines to reflect training standards required across the industry were:

Hans Geertsema, Afton Mines Limited

Fred Mason, Afton Mines Limited

Bill Savilow, B.C. Coal Ltd.

Vern Bouck, Bethlehem Copper Corporation

Jerry LeBlanc, Bethlehem Copper Corporation

Don Miller, Brenda Mines Limited

Gerry Cooper, Brinco Mining Limited

Richard Schwengler, Equity Silver Mines Limited

Don Fraser, Cyprus Anvil Mining Corporation

Terry Wozniak, Fording Coal Limited

Norm Myhre, Gibraltar Mines Limited

George Sutherland, Highmont Operating Corporation

Fred Savage, Ministry of Education
Don McColman, Newmont Mines Limited
John Graham, Noranda Mines Limited
Charles Heikkila, Noranda Mines Limited
Les Redord, Noranda Mines Limited
Dennis LeDuc, Placer Development Limited
Larry Hartley, Utah Mines Limited

In addition, the following individuals participated in the review workshop for the *Shovel Operator* outline:

John Cochrane, Noranda Mines Limited
Claude Bourgeois, Placer Development Limited

Field-testing the Haulage Truck Operator Outline

In June 1980 three companies (B.C. Coal Ltd; Noranda Mines Limited, Granisle Mine; Brinco Mining Limited) offered to field-test the new *Haulage Truck Operator* outline for a six month period and report back to the group. During the fall, it was further agreed that the other participating mines in the project would also field-test the outline and would complete a questionnaire. In the winter of 1981 all mines reported that the outline had been used successfully to improve the truck operator training at their mine and some reported making major revisions of their training programs as a result of the outline.

USE OF TRAINING OUTLINES

Additions and Modifications

References are made in the outlines to areas where policies will vary from company to company and it is up to trainers to insert their company policies in these places.

Each training outline is based on a specific manufacturer and model of equipment, for example the shovel is an P & H - 2100 BL. In order to use the material for a different manufacturer or model, a trainer must review the outline and make necessary modifications. It is anticipated that only the section on gauges and controls will need major changes.

For Lesson Plans

The outlines do not contain lesson plans. Rather the trainer should use the outlines as a guide when preparing lesson plans both for classroom and on-the-job training activities. Trainers are encouraged to expand upon the outlines to suit their own situation.

For Testing

The outline should also be used as a guideline for written, oral, and practical testing. Trainers should ensure that upon completion of training, each trainee can perform every objective listed in the outline. It will take time and experience on-the-job before a trainee becomes a proficient operator. Regular on-the-job monitoring by supervisors and trainers can greatly assist the trainee in developing and maintaining the skills needed to be a heavy equipment operator.

Sample tests for the outlines have been written and are available to trainers from:

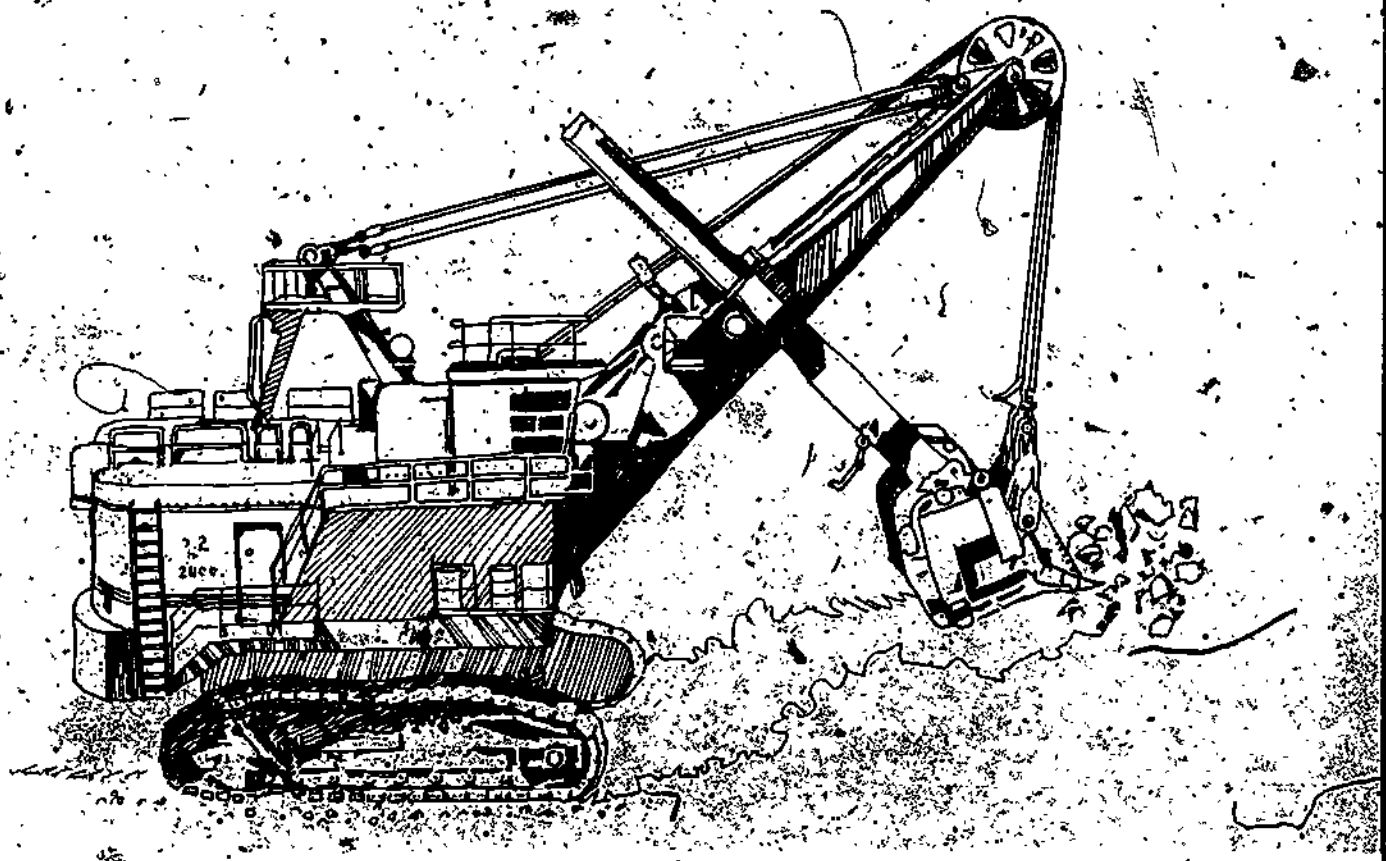
Research & Curriculum Development Branch,
Ministry of Education,
7451 Elmbridge Way,
Richmond, B.C.
V6X 1B8
Telephone: (604) 278-3433

For Trainees

The outlines provide valuable information on operating heavy equipment and give clear statements on what trainees must be able to do by the end of their training. Therefore, it is recommended that trainees be given a copy of both the skill profile chart and the outline.

BASIC SAFETY AND OPERATING RULES

module 1



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OBJECTIVE 1-1

The shovel operator will explain how safety and equipment operating rules, set by the company and the *Mines Regulation Act*, protect the operator and fellow workers at the mine site.

KEYPOINTS/PROCEDURES

1. The following are basic safety and equipment operating rules. Individual companies should incorporate their own safety rules into this material.

2. **Personal wear**

   The safety rules for personal wear are set for the protection of the shovel operator and include proper:

   - Hard hats
   - Footwear
   - Eye protection
   - Hearing protection
   - Gloves

   Avoid wearing loose clothing.

3. **Personal conduct**

   Rules concerning personal conduct are enforced for the safety of all personnel on the mine site and cover:

   - Accident and injury reporting.
   - Horseplay.
   - Reading on the job.
   - Alcohol and drugs.
   - Careless operating.

4. **Pre-start check**

   Safety rules ensure personal protection while conducting the check and also ensure that the shovel is in a safe operating condition before it is put into production. Special caution is required when:

   - Climbing on or off of the shovel.
   - Checking crowd, boom and gantry components.
   - Working around moving components such as the compressor or magnetorques.
   - Working around high voltage electrical components.

   It is essential to report immediately any operational problems with the brakes or controls. The shovel must always be equipped with a fire extinguisher.

5. **Operating**

   It is the operator's responsibility to ensure that the shovel is operated safely. The following operating rules ensure the safety of the shovel operator and other personnel in the work area of the shovel:

   - Only authorized personnel may operate a shovel.
   - Practise good housekeeping at all times (Objective 7-4).
   - All personnel should follow the company's power cable handling policy (Objective 1-13).

- All personnel should follow the shovel boarding procedures (Objective 1-12).
- Do not walk between the shovel and the work face.
- Check all of the blind areas surrounding the shovel before moving it.
- Watch all clearances when swinging.
- Immediately follow all emergency and warning signals given by others.
- Do not oil, grease or adjust the shovel while it is in motion.
- Do not operate within minimum safety distances of overhead power lines.
- Do not swing the dipper, loaded or empty, over personnel or equipment.
- Do not push trucks or other equipment with the shovel dipper.
- Always set the dipper on the ground and apply all of the brakes before leaving the operator's seat.

6. **Traffic control scheme**

It is the shovel operator's responsibility to know and obey the traffic control scheme as set out by the company (Objective 1-4). Rules 264 (b) of the *Mines Regulation Act* and 196 (b) of the *Coal Mines Regulation Act* both state:

> The owner, agent, or manager of every mine shall prepare a traffic control scheme for his operation and shall have it accepted by the Inspector, and the scheme shall show the maximum-allowable speeds for the vehicles in use, rules for passing, "stop" and "yield" locations, priority rules for various vehicles, rules for night operation, maximum operating grades, emergency run-off protection, and such other information as may be required by the Inspector.

7. **Loading areas**

Loading rules ensure a safe and efficient operation at the loading area. The shovel operator is the key person and has direct control of activities in the loading area. The shovel operator should be alert for the following conditions:

- Overhangs at the work face.
- Excessive traffic in the area.
- Additional equipment in the area.
- Restricted loading areas.
- Shovel, arch and cable positions.

Arch and power cable positions are covered in OBJECTIVE 6-9.

8. **Servicing**

Servicing rules ensure the safety of all persons while the shovel is being serviced. The shovel operator must follow these procedures:

a. Position the shovel in a clear area.

b. Set the dipper on the ground.

c. Apply all of the brakes.

d. Shut the shovel off.

e. Get out of the cab and direct the service truck driver to back up to the shovel.

Servicing procedures are covered in OBJECTIVE 7-3.

9. **Parking**

Safe parking procedures are established for the safety of personnel working around the shovel. The operator must perform all of the following procedures before leaving the shovel:

a. Position the shovel in a clear area.

b. Set the dipper on the ground.

c. Set all of the brakes.

d. Shut off the MG (Motor Generator) set.

OBJECTIVE 1-2

The shovel operator will explain the importance of reporting accidents and injuries.

KEYPOINTS/PROCEDURES

1. **Accidents**

   All accidents must be reported to a supervisor as soon as possible. In the event of a serious accident, do not disturb the accident scene unless there is a risk of further damage or a danger to personnel.

2. **Injuries**

   All injuries, no matter how slight, must be reported to a supervisor and to the first aid station. Any injury where the skin is broken must be treated to avoid infection. In cases of serious injury, do not move the victim — send for the first aid attendant.

3. **Investigations**

   Reporting accidents and injuries makes way for an investigation to be carried out to determine the cause. These investigations often lead to new rules or procedures that create a safer working environment for all employees.

   Note:

   It is the responsiblity of all employees to report any hazardous act or condition to their supervisors immediately.

OBJECTIVE 1-3

The shovel operator will describe the changing conditions that can occur at the mine site and explain the importance of staying alert to changing conditions.

KEYPOINTS/PROCEDURES

1. **Weather**

   Rain, snow and fog each have an effect on the operator's visibility. Additional caution is required while operating under poor weather conditions.

2. **Other equipment**

   The shovel operator must be alert at all times, to other equipment or personnel entering the work area.

3. **Traffic control scheme**

   The traffic control scheme at the work face is constantly changing and the shovel operator must always be aware of the changes. Use extreme caution during all loading procedures.

4. **Working conditions**

   Working conditions are constantly changing at the work face. The shovel operator must be alert for the movement of other equipment and for the sloughing or rolling down of material from the face.

5. **Shovel performance**

   An alert operator can determine a change in the shovel's performance by sound and by comparing how the shovel reacts under normal working conditions. For example, the operator can tell if the shovel is losing power.

6. **Light**

   The change from daylight to darkness and vice-versa creates operating conditions that demand added attention and alertness.

OBJECTIVE 1-4

The shovel operator will describe the traffic control scheme at the mine site.

KEYPOINTS/PROCEDURES

1. Although the shovel is mainly a stationary piece of equipment, it usually makes a short production move every 1 to 3 hours and occasionally makes a major move from one digging site to another. The shovel operator must know the company's traffic control scheme in order to move within the established traffic patterns at the loading areas and on the haulage roads.

2. **Right of way**

   The right of way priority system can change from property to property. An example of a right of way priority system is:

   a. Ambulance, rescue and fire trucks.
   b. Buses.
   c. Road maintenance equipment.
   d. Loaded production trucks.
   e. Empty production trucks.
   f. Explosive trucks and fuel trucks.
   g. All other trucks or equipment.

   The shovel, when moving is usually granted the right of way over normal production equipment. It is a common practice to have a person assigned to signal the operator and to direct traffic when the shovel makes a major move.

   Caution:

   A set of right of ways provides guidelines, but all operators must use judgement in all circumstances. Remember that a right of way can only be given, it cannot be taken.

3. **Traffic signs**

   Obey all traffic signs and signals including stop or yield signs, hand signals and directional signs.

4. **Merging traffic**

   Merging traffic must yield to through traffic unless otherwise informed by a supervisor.

5. **Arch and power cable positions**

   The arch and power cable must be positioned to allow traffic to follow the designated traffic patterns within the shovel's loading area.

6. **Parking**

   Shovels should always be parked in a safe and level area. Never park within 50 feet of the work face or within less than the company's established parking distance for other equipment. The dipper must be lowered to the ground and all brakes applied.

OBJECTIVE 1-5

The shovel operator will explain the importance of preventing tire damage.

KEYPOINTS/PROCEDURES

1. **Work face area**

   The shovel operator must constantly be alert to loose rock sloughing from the work face and spill rock from haulage trucks or the shovel dipper. Arrange for a clean up as often as necessary, to prevent tire damage to the haulage trucks.

2. **Loading trucks**

   The shovel operator must spot and load trucks correctly to prevent spill rock. Overloading and side loading can leave spill rock in the areas that the truck may travel (ramps, dumps, etc.). Incorrectly spotted trucks or erratic swing control can cause spill rock from the shovel dipper. The operator must use caution when digging close to the rear of the truck, as the shovel dipper can snag the tire.

3. **Level grade**

   The shovel operator must maintain a level grade to prevent erratic swing control. A level pit floor is necessary for maintaining water control and aids in preventing spill rock from haulage trucks.

OBJECTIVE 1-6

The shovel operator will explain both normal and emergency braking techniques for stopping the shovel.

KEYPOINTS/PROCEDURES

1. **Normal braking**

   The shovel operator should follow these procedures to stop or reverse the direction of the shovel:

   - Hoist motion — When hoisting or lowering the dipper, reverse the direction of the hoist controller.
   - Crowd motion — When crowding or retracting the dipper, reverse the direction of the crowd controller.
   - Swing motion — When swinging the dipper, depress the opposite swing pedal.
   - Propel motion — When propelling, reverse the direction of the propel controller.

2. **Holding brakes**

   The hoist, crowd, swing and propel brakes are not intended for use as braking devices, except in an emergency situation. They are used as temporary holding brakes or parking brakes. All motion should be stopped before these brakes are applied. If the shovel is going to be idle for more than a few minutes the dipper should be set on the ground.

3. **Hoist/crowd motion**

   The shovel operator should follow these emergency braking procedures for hoist or crowd motion:

   a. Fully reverse the direction of the hoist and crowd controllers.

   b. Use swing motion to redirect the dipper to a clear area.

   c. Apply the hoist/crowd brake.

4. **Swing motion**

   The shovel operator should follow these emergency braking procedures for swing motion:

   a. Fully depress the opposite swing pedal.

   b. Lower the dipper to the ground to aid in braking, or if possible, raise it above the object in danger of being hit.

   c. Apply the swing brake.

5. **Propel motion**

   The shovel operator should follow these emergency braking procedures for propel motion:

   a. Fully reverse the direction of the propel controller.

   b. Once the shovel comes to a stop, apply the propel brake by transferring the crowd propel transfer switch to the crowd mode.

   c. If the propel controller malfunctions, and the shovel continues moving, apply the propel brake immediately.

6. If there is an AC or DC power loss, all brakes will automatically apply. If one of the control circuits malfunctions, stop the shovel by pushing the MG set stop button.

OBJECTIVE 1-7

The shovel operator will explain why it is important to practise good housekeeping.

KEYPOINTS/PROCEDURES

1. The importance of good housekeeping is to maintain a safe and pleasant working environment. Good housekeeping is an essential part of each employee's job. It is the responsibility of the shovel operator to keep the shovel in good condition. Disorderly and dirty work areas can cause accidents, personal injuries and low morale. Good housekeeping on the shovel is essential for safety and includes the following:
   - Keep all windows and mirrors clean for good visibility.
   - Clean all grease and oil spills as soon as possible.
   - Keep the cab and house floors clean of all paper, rags, dirt, mud and aerosol cans.
   - Keep all stairs, ladders, railings and catwalks clean of grease, oil and mud build-up.
   - Keep all stairs, catwalks and walkways clear of tools, materials and other obstructions.
   - Keep the immediate area around the shovel clean.

   Caution:

   Aerosol cans can cause serious injuries by exploding.

OBJECTIVE 1-8

The shovel operator will explain the mine site guarding and blasting procedures.

KEYPOINTS/PROCEDURES

1. The blasting procedure is enacted on the day of the blast. Employees should be notified of the blast, although this notification is not the final precaution. Before blasting, all employees must be cleared to a safe distance and the supervisor must make a careful physical check to ensure that no one is left in the blasting area. All access roads must be closely guarded to prevent access into the blast area.

2. The guard has the responsibility to stop anyone from entering the blast area. No employee should attempt to pass the guard without the blasting foreman's permission. Guards are visibly identified, often by a colored vest. Guards remain at the designated location until relieved by the blasting foreman or by the person who assigned them as guards.

3. Should any irregularities occur, it is the guard's responsibility to immediately notify the blasting foreman of the problem.

OBJECTIVE 1-9

Given a map of the pit area layout, the shovel operator will locate and name the different pits, haul roads, dump areas, shop area and first aid station. The dump areas will include waste dumps, stockpiles and breaker or crusher station locations.

KEYPOINTS/PROCEDURES

1. It is important that all employees know the basic layout of the pit area and be kept informed of any changes. This contributes to both the safety and efficiency of the operation.
2. Each property is different in layout, and in the names and numbers of the dumps, pits, roads, etc.

OBJECTIVE 1-10

The shovel operator will explain and demonstrate the proper use of fire suppression systems and fire extinguishers.

KEYPOINTS/PROCEDURES

1. **Fire extinguishers**

   All shovels are equipped with portable fire extinguishers. To use the portable fire extinguisher, remove the safety ring pin and depress the actuator. The chemical flow should be aimed at the base of the fire and slowly moved from side to side. This side to side action forces the flames away from the source and has a cooling effect. The chemical cuts off the oxygen at the source of the flame and puts out the fire.

2. **Fire suppression systems**

   The fire suppression system consists of three major components: dry chemical tanks mounted on the shovel; an acutation device with a pressure source to distribute the chemical agent; and a delivery system to carry the chemical to the nozzles, located in all critical areas of the shovel.

   Manually activate the system by pulling the safety ring pin and depressing the actuator located in the cab or on the exterior of the shovel. The chemical agent is delivered through the delivery system, to the nozzle locations.

3. Speed is the most important factor in combating a fire. First shut the shovel off. Then suppress the fire as quickly as personal safety permits to avoid being faced with a more widely spread fire that is difficult to contain.

4. Heat remaining from the fire can cause re-ignition. The operator should standby, at a safe distance, with a portable fire extinguisher until all possibility of re-ignition is past.

OBJECTIVE 1-11

The shovel operator will describe a miss-hole and state the procedure for reporting the location of a miss-hole.

KEYPOINTS/PROCEDURES

1. A miss-hole is a drill hole that was loaded with explosives which did not explode during the blast, leaving the hole still full of explosives.
2. The shovel operator locating a miss-hole, should notify a supervisor immediately. Properly mark the miss-hole. No equipment should be operated within 25 feet of the miss-hole until the powder is removed and the hole defused.

OBJECTIVE 1-12

The shovel operator will explain the shovel boarding procedures used at the mine site.

KEYPOINTS/PROCEDURES

1. Shovel boarding procedures should be established by the company. This is an example of a possible boarding procedure:

   a. Any person wishing to board or leave a working shovel must first obtain the shovel operator's permission.

   b. The person boarding the shovel is responsible for establishing visual contact with the operator before pulling the ladder down.

   c. The operator must swing the shovel until the ladder is in a safe area to board.

   d. The operator must set all of the brakes, get out of the seat and stand at the cab door until the person boarding or leaving the shovel is completely off of the ladder and has it back in place.

   Caution:

   Never board or leave a shovel while it is in motion. Use the handrails and steps to get on or off of the shovel.

OBJECTIVE 1-13

The shovel operator will explain the company's power cable handling policy.

KEYPOINTS/PROCEDURES

1. Each company should establish a power cable handling policy to be followed by all personnel handling power cable. The policy should include the following precautions:

   - 10,000 volt hot gloves or other approved protective devices must be used at all times when handling power cable. Do not step on power cable or allow power cable to come in contact with any other part of the body. Inspect the hot gloves before use and discard them if they are defective. Do not use hot gloves that are wet inside. Hot gloves must be covered with leathers and should not be used for any purpose other than handling power cable.
   - All power cable attached to sub-stations or switch houses must be treated as energized.
   - Never place any part of the body, even if protected by hot gloves, on or near cable terminals located inside potheads and junction boxes.
   - No one, other than an authorized person, is to energize, de-energize, connect or disconnect power cables.
   - Cable arches must be treated the same as power cable when the cable over the arch is connected to a sub-station or switch house.
   - Report any cuts or bruises in the cable. Do not handle damaged power cable unless it has been checked by an authorized person. Only qualified electricians are authorized to make repairs to power cables.
   - Never run over unprotected power cable with any vehicle or piece of equipment.
   - Never pull more than 75 feet of power cable in a single pull. Power cables can be damaged by stretching.
   - When junction boxes and potheads are being moved, they must be adequately supported and kept clear of the pit floor. Rough handling of junction boxes can cause damage to the boxes and to the power cable by the flexing of the cables at the boxes.
   - Disconnected cable retains a residual charge of about 110 volts. Caution must be used when handling disconnected cable.
   - The input side (hotside) of the switch house must be padlocked if it is a pothead, so that it cannot be removed.

OBJECTIVE 1-14

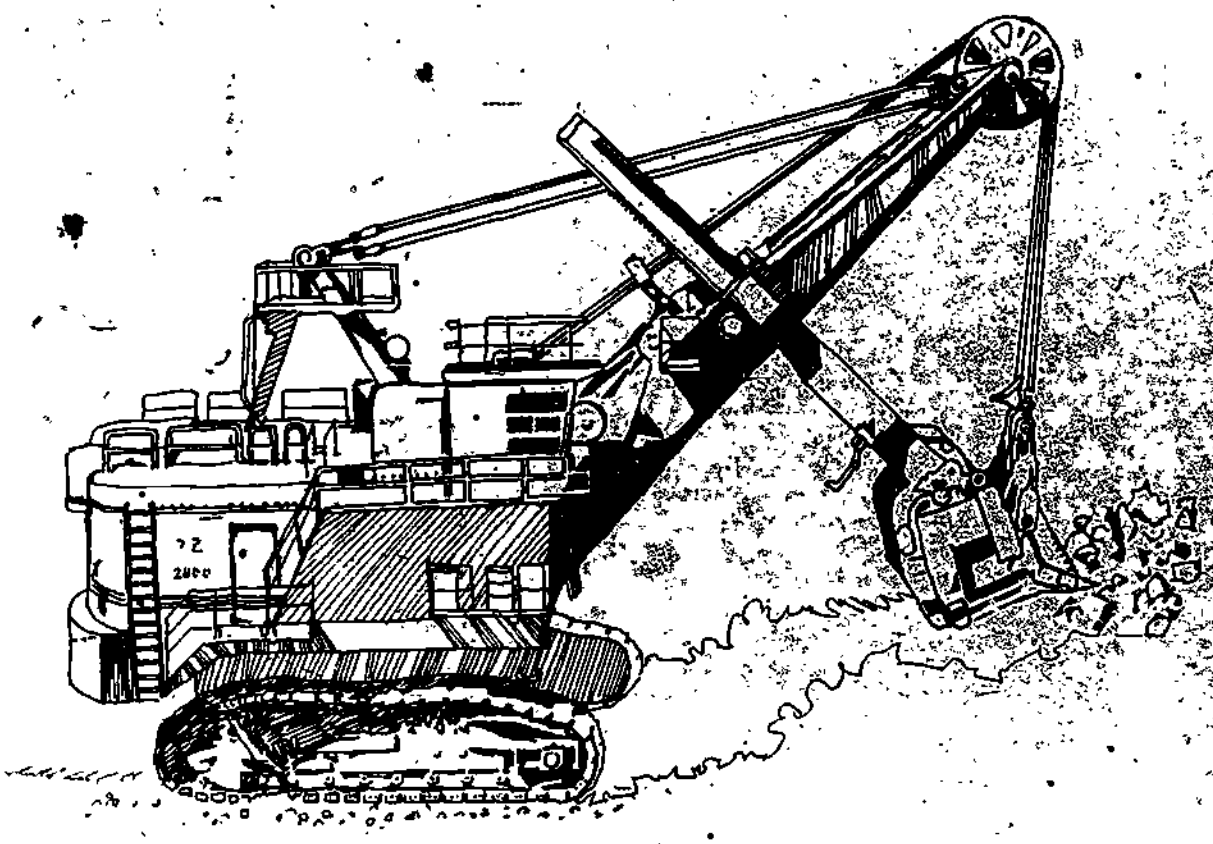
The shovel operator will explain the company's lock-out procedures.

KEYPOINTS/PROCEDURES

1. To ensure the safety of maintenance and operating personnel, the company should establish a procedure for locking-out equipment, to be followed by all personnel.
2. Locking-out equipment means that wherever the possibility of equipment starting, energizing, or moving exists, which can create a hazardous situation, that piece of equipment should be locked-out and tagged by the operator. A lock-out procedure is designed to prevent accidents and personal injury. Never remove another worker's padlock or tag without authorization. Check with the supervisor for instructions.
3. The shovel operator is required to know the location of the lock-out station for the shovel, and must always check the station for padlocks or "do not operate" tags, before starting the shovel.

COMMUNICATIONS

module 2



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OBJECTIVE 2-1

The shovel operator will describe the:

a. Horn signals used by the shovel and truck operators.

b. Hand signals used to direct the shovel operator during a move.

KEYPOINTS/PROCEDURES

1. A signal for HELP WANTED should be established at the property and all of the employees informed of it.

2. **Shovel operators signals**

   The shovel operator is required to give the following signals to the operators of other pieces of equipment:

   - Warning before moving — one blast.
   - Stop — one blast.
   - Go ahead — two blasts.
   - Backup — three blasts.
   - Reposition or tail load — four blasts.

3. **Truck operator giving signals**

   The shovel operator is required to know these horn signals:

   - Start engine — one blast.
   - Stop — one blast.
   - Go ahead — two blasts.
   - Backup — three blasts.

   All trucks should be equipped with automatic backup horns. The shovel operator should be alert for this warning of a truck backing up.

4. **Hand signals**

   The shovel operator is required to know the following hand signals:

   - Forward propel — Both hands are held in front and rotated in a clockwise motion.
   - Reverse propel — Both hands are held in front and rotated in a counter-clockwise motion.
   - Left steer (forward propel) — The left forearm is held vertical with the fist clenched and the right hand is rotated in a clockwise motion.
   - Left steer (reverse propel) — The right forearm is held vertical with the fist clenched and the left hand is rotated in a counter-clockwise motion.
   - Right steer (forward propel) — The right forearm is held vertical with the fist clenched and the left hand is rotated in a clockwise direction.
   - Right steer (reverse propel) — The left forearm is held vertical with the fist clenched and the right hand is rotated in a counter-clockwise motion.
   - Hoist dipper — With the forearm vertical and the forefinger pointing up, move the hand in small horizontal circles.

- Lower dipper — With the arm extended downward and the forefinger pointing down, move the hand in small horizontal circles.
- Swing — Extend the arm and point with the forefinger in the desired direction of swing.
- Stop — Extend both forearms and hands in a horizontal position and make a slicing motion (any unusual or frantic motion of the arms should be taken as a stop signal and the reasons for this motion should be determined before preceeding).
- Set brakes — Both forearms are held vertical with the fists clenched.

The shovel operator should discuss the hand signals with the signal person before moving the shovel.

OBJECTIVE 2-2

Given a sample of the report forms used by the company, the shovel operator will complete production reports, timecards and the daily logbook.

KEYPOINTS/PROCEDURES

1. Reporting requirements vary from property to property.
2. **Production reports**

   Production reports are filled out by the shovel operator to include the:

   - Number of the shovel being operated.
   - Area code number of the pit in which the shovel is working.
   - Code number of the material being loaded.
   - Number of trucks loaded during the shift.
   - Number of hours worked in the shift.
   - Number of hours of downtime, if any.
   - Number of hours idle, if any.

   Production reports are used for costing and planning purposes. Therefore it is imperative that they be accurate.

3. **Timecards**

   Timecards are filled out by the shovel operator and include the:

   - Code number for the proper job classification and rate of pay.
   - Number of hours worked on each job.
   - Number of the shovel being operated.
   - Area code number of the pit in which the shovel is working.
   - Code number of the material being loaded.
   - Total number of hours worked in each shift.

4. **Daily logbooks**

   The daily logbooks are filled out regularly and cover the following information:

   - Any repairs made to the shovel during the shift.
   - Any general information, for example on the controls and brakes, which can help the oncoming operator.

   Logbooks are important because they let the oncoming operator know the prior shift's history of the shovel. Any unsafe or hazardous conditions should be reported to a supervisor and to the oncoming shovel operator.

OBJECTIVE 2-3

The shovel operator will operate the mobile radio and explain the proper procedures for its use.

KEYPOINTS/PROCEDURES

1. Proper and effective use of the mobile radio is important. Follow this procedure:
   a. Identify the sender by unit or vehicle number.
   b. Identify the receiver by unit or vehicle number.
   c. Wait until the receiver acknowledges.
   d. Relay the message in a clear and precise manner.
   e. State immediately if the call is an emergency.
2. Radio use is restricted to necessary operational transmissions. Use no profane language over the radio at any time.
2. In the event of a hazardous situation or an emergency, contact the dispatcher or supervisor immediately. If radio silence is necessary, either the dispatcher or the immediate supervisor can call for it. This depends on the procedures established at the property.

OBJECTIVE 2-4

The shovel operator will explain the different survey stakes used at the mine site.

KEYPOINTS/PROCEDURES

1. Each mining property has its own system for survey staking and color coding of the stakes and should include this information.

2. **Primary control points**

   The primary contol point is the basis for all survey work in the area and has been set with the utmost accuracy.

3. **Secondary control points**

   Secondary control points are set from the primary control point and are the basis for all actual field work.

4. **Batterboards**

   Batterboards are used for marking boundaries between ore, marginal and waste material.

5. **Drill hole stakes**

   Drill hole stakes mark the location for drilling blast holes. On the stake is the code number of the blast hole and the depth it is to be drilled. These stakes are normally retained after drilling, for loading information.

6. **Drill limit stakes**

   Drill limit stakes mark the drilling boundaries in order to avoid unnecessary drilling.

7. **Digging limit stakes**

   Digging limit stakes mark the digging limits. The shovel operator should not attempt to dig beyond these stakes without authorization. Digging limit stakes are often used as blast boundary stakes.

8. **Blast boundary stakes**

   Blast boundary stakes indicate the blast boundary limits, to allow the cleanup and drilling of a new blast area. These stakes are often used as digging limit stakes.

9. **Dump monitors**

   Dump monitor stakes monitor the amount of settling or movement along the crest of a dump. These monitors are extremely important for safety and must be checked regularly.

10. **Road grade stakes**

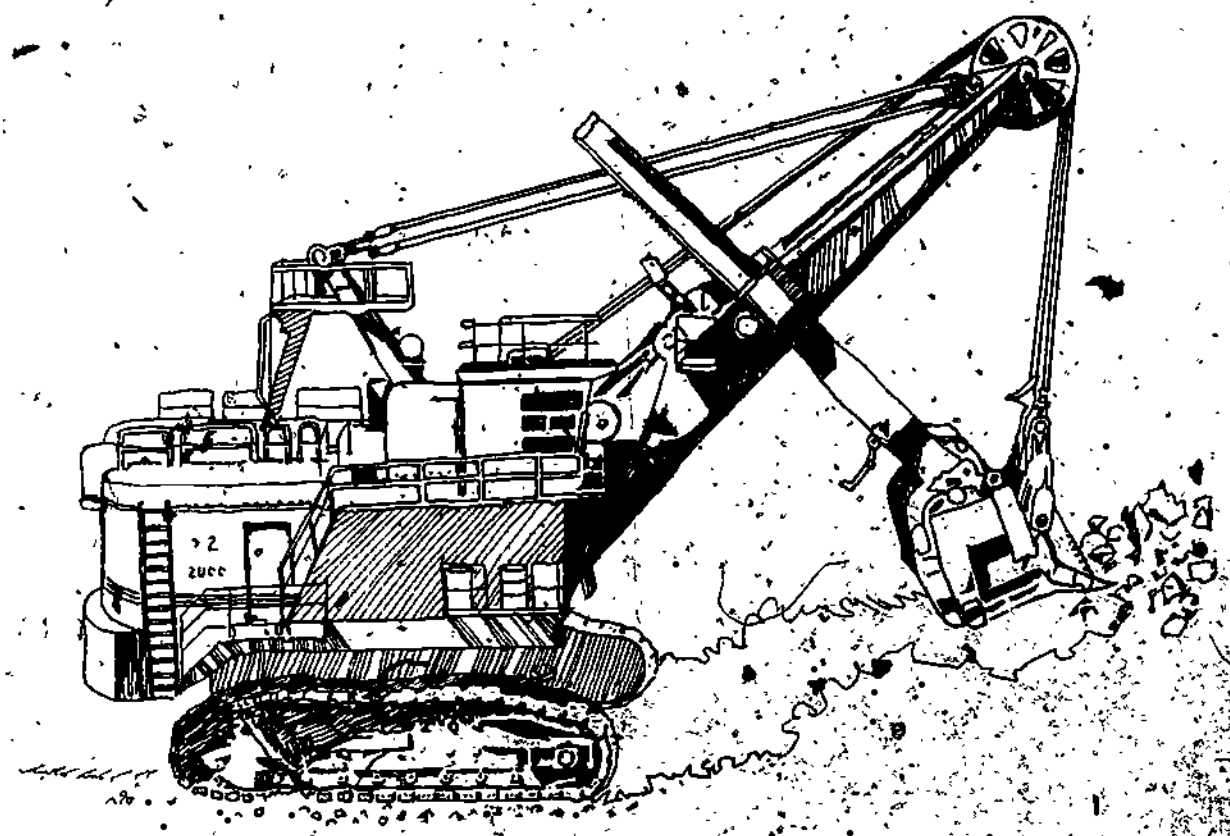
    Road grade stakes mark the center and shoulders of a road under construction and usually have the amount of fill (+) or ripping (–) that is required written on them.

11. **Bench grade stakes**

    Bench grade stakes indicate the planned bench grade and usually have the amount of fill (+) or ripping (–) that is required written on them.

INDICATORS AND CONTROLS

module 3



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OBJECTIVE 3-1

The shovel operator will locate and identify all of the gauges, indicators, controls and switches.

KEYPOINTS/PROCEDURES

1. Shovel gauges and indicators include:
   - Swing brake indicator light.
   - Hoist/crowd brake indicator light.
   - Ground fault indicator light.
   - Main air pressure gauge (cab).
   - Main air pressure gauge (house).
   - AC volt meter.
   - DC volt meter.
   - Hour meter.
   - Crowd limit alarm bell.
   - Upper frame grease system regulator gauge (house).
   - Lower frame grease system regulator gauge (house).
   - Open gear lube system regulator gauge (house).
   - Upper frame grease system indicator light (house).
   - Lower frame grease system indicator light (house).
   - Open gear lube system indicator light (house).
   - Auto-lube systems warning buzzer.
2. Shovel controls and switches include:
   - Crowd/propel controller.
   - Hoist controller.
   - Air horn lever.
   - Dipper trip lever.
   - Left swing pedal.
   - Right swing pedal.
   - Remote air horn lever (outside).
   - Hoist/crowd brake release button.
   - Hoist/crowd brake set button.
   - Crowd/propel transfer switch.
   - Propel steer switch.
   - Swing brake switch.
   - MG set start button.
   - MG set stop button.
   - Heater circuit breaker.
   - Cab lights circuit breaker.

- Flood lights circuit breaker.
- Windshield wiper control knob.
- Cab heater thermostat (optional).
- Cab defroster switch (optional).
- Run/off/test switch (house).
- Exciter breaker (house).
- Auxiliary breaker (house).
- Air compressor control switch (house).
- Upper frame grease system test button (house).
- Lower frame grease system test button (house).
- Open gear lube system test button (house).
- Remote swing brake switch (outside).

OBJECTIVE 3-2

The shovel operator will describe the function of each gauge and indicator and explain what action to take.

KEYPOINTS/PROCEDURES

1. **Swing brake indicator light**

   The swing brake indicator light indicates that the swing brake is released. If the light does not come on when the swing brake switch is placed in the off position, the remote swing brake switch should be checked.

2. **Hoist/crowd brake indicator light**

   The hoist/crowd brake indicator light indicates that the hoist and crowd brakes are released.

3. **Ground fault indicator light**

   The ground fault indicator light indicates a ground fault in the auxiliary or control wiring. The operator should stop the shovel and notify a supervisor. Do not allow anyone to board or leave the shovel until authorized to do so.

4. **Main air pressure gauge (cab)**

   The main air pressure gauge registers the air pressure in the air compressor receiver. The pressure must be a minimum of 105 psi before the MG set can be started. If the air pressure drops below 105 psi, while operating, the operator should stop the shovel and notify a supervisor. If the air pressure drops below 90 psi, the MG set will stop and all of the brakes will set automatically.

5. **Main air pressure gauge (house)**

   The main air pressure gauge serves the same function as the main air pressure gauge in the cab.

6. **AC volt meter**

   The AC volt meter indicates the voltage applied to the auxiliary motors and controls. Report any fluctuations in this gauge.

7. **DC volt meter**

   The DC volt meter indicates the voltage on the DC side of the static exciter. Report any fluctuations in this gauge.

8. **Hour meter**

   The hour meter records the total hours of shovel operation.

9. **Crowd limit alarm bell**

   The crowd limit alarm bell sounds when the operator crowds or retracts the dipper sticks beyond their operational limits. The operator should reverse the function of the crowd controller.

10. **Upper frame grease system regulator gauge (house)**

    The upper frame grease system regulator gauge registers the regulated air pressure to the lubricant pump. It should be reported if the gauge does not register the proper air pressure, while pumping.

11. **Lower frame grease system regulator gauge (house)**

The lower frame grease system regulator gauge registers the regulated air pressure to the lubricant pump. It should be reported if the gauge does not register the proper air pressure, while pumping.

12. **Open gear lube system regulator gauge (house)**

The open gear lube system regulator gauge registers the regulated air pressure to the lubricant pump. It should be reported if the gauge does not register the proper air pressure, while pumping.

13. **Upper frame grease system indicator light (house)**

The upper frame grease system indicator light indicates a malfunction in the grease system. The operator should report to a supervisor and not operate the shovel until authorized to do so.

14. **Lower frame grease system indicator light (house)**

The lower frame grease system indicator light indicates a malfunction in the grease system. The operator should report to the supervisor and not propel the shovel until authorized to do so.

15. **Open gear lube system indicator light (house)**

The open gear lube system indicator light indicates a malfunction in the lube system. The operator should report to the supervisor and not operate the shovel until authorized to do so.

16. **Auto-lube systems warning buzzer**

The auto-lube systems warning buzzer sounds if any auto-lube system malfunctions. The operator should determine which system has malfunctioned, and report to the supervisor. When an auto-lube system malfunctions, the operator may be required to determine the cause and may be allowed to operate for a limited time afterwards. This varies from company to company.

OBJECTIVE 3-3

The shovel operator will describe the function of each control and switch and explain the actions of the control.

KEYPOINTS/PROCEDURES

1. **Crowd/propel controller**

The crowd/propel controller is in neutral position when it is vertical. Whenever the controller is released it automatically returns to neutral. Follow these procedures for crowd operation:

a. The crowd/propel transfer switch must be in the crowd position and the hoist crowd brake must be released for crowd operation.

b. Starting from neutral position, push the controller forward to crowd the dipper sticks and pull it back to retract them. The amount of force applied to the dipper depends on the distance that the controller is moved. Moving the controller varies the potential in the control circuit, which increases or decreases the crowd motor torque.

c. To stop or reverse the direction, when crowding or retracting, reverse the direction of the controller. To hold the dipper stopped, apply the hoist/crowd brake.

Follow these procedures for propel operation:

a. The crowd/propel transfer switch must be in the propel position. This automatically releases the propel brakes.

b. Starting from the neutral position, push the controller forward to propel the shovel forward and pull it back to reverse the shovel. The speed the shovel moves depends on the distance the controller is moved. Moving the controller varies the potential in the control circuit which increases or decreases the propel motor torque.

c. To stop the propel motion, on a level grade, allow the controller to return to the neutral position and friction normally stops the motion, although it may be necessary to slightly reverse the direction of the controller. If the shovel is on an uphill or downhill grade it is necessary to fully reverse the direction of the controller to stop the motion. To hold the dipper stopped, apply the propel brakes.

Note:

The forward and reverse propelling procedures assume that the cab is facing over the front idlers of the lower frame.

2. **Hoist controller**

The hoist controller is off when the controller is in the extreme forward position. Whenever the controller is released it automatically returns to the off position. Follow these procedures to operate the hoist controller:

a. To hoist the dipper, release the hoist/crowd brake and pull the controller back from the off position. The amount of torque applied to the hoist drum, for hoisting the dipper, depends on the amount that the controller is moved.

b. To lower the dipper, slowly allow the controller to move forward towards the off position. This permits the dipper to lower by gravity force. The speed at which the dipper lowers depends on the weight of the dipper, the amount of material, if any, and the speed at which the controller is allowed to move forward.

c. To stop the dipper, when hoisting or lowering, reverse the direction of the controller. To hold the dipper stopped, apply the hoist/crowd brake.

3. **Air horn lever**

Squeezing the air horn lever, towards the controller, operates the air horn.

4. **Dipper trip lever**

Squeezing the dipper trip lever, towards the controller, operates the trip mechanism which opens the dipper door. The dipper trip motor has automatic protection against overheating. Holding the dipper trip lever squeezed for too long a period causes the circuit to kick out, releasing the trip mechanism. The circuit automatically resets after it has cooled.

5. **Left swing pedal**

Pushing down on the left swing pedal causes the upper frame to swing to the left. To stop or reverse direction, release the pressure on the left swing pedal and push down on the right swing pedal. To hold the swing motion stopped, apply the swing brake.

6. **Right swing pedal**

Pushing down on the right swing pedal causes the upper frame to swing to the right. To stop or reverse direction, release the pressure on the right swing pedal and push down on the left swing pedal. To hold the swing motion stopped, apply the swing brake.

7. **Remote air horn lever (outside)**

The remote air horn lever operates the shovel's air horn. It is usually located near the boarding ladder and is accessible from ground level. It is normally used to attract the attention of the operator or to signal an emergency situation. The operator should always stop the shovel immediately and investigate the cause whenever the air horn is sounded from this location.

8. **Hoist/crowd brake release button**

Pushing the hoist/crowd break release button releases both the hoist and crowd brakes.

9. **Hoist/crowd brake set button**

Pushing the hoist/crowd brake set button sets both the hoist and crowd brakes.

10. **Crowd/propel transfer switch**

The crowd/propel transfer switch determines whether the crowd/propel controller operates in the crowd or propel mode. If the switch is in the crowd position the controller crowds or retracts the dipper sticks. If the switch is in the propel position the propel brakes automatically release and the controller propels the shovel.

11. **Propel steer switch**

The propel steer switch determines the steering mode of the shovel when the crowd/propel transfer switch is in the propel position. The crowd/propel controller controls the amount that the shovel is steered.

When the switch is in the left position, the left male jaw clutch disengages and the

left propel brake engages. This locks-up the left track and, when the controller is moved forward, the shovel turns to the left.

When the switch is placed in the off position, both brakes are released, both jaw clutches engaged and the shovel is propelled straight ahead or back when the controller is moved.

When the switch is placed in the right position, the right male jaw clutch disengages and the right propel brake engages. This locks-up the right track and, when the controller is moved forward, the shovel turns to the right.

The forward turning procedures assume that the cab is facing over the front idlers of the lower frame.

12. **Swing brake switch**

Placing the swing brake switch in the off position releases the swing brakes and placing the switch in the on position sets them.

13. **MG set start button**

Pushing the MG set start button energizes the shovel's starting circuits and starts the main AC motor.

14. **MG set stop button**

Pushing the MG set stop button de-energizes the shovel's starting circuits and the main AC motor. All brakes are set automatically when the stop button is pressed.

15. **Heat circuit breaker**

The heater circuit breaker controls the portable heater receptacle and provides overcurrent protection for the circuit.

16. **Cab lights circuit breaker**

The cab lights circuit breaker controls the lights in the cab, house and those mounted on the underside of the upper frame. It also provides overcurrent protection for the circuit.

17. **Flood lights circuit breaker**

The flood lights circuit breaker controls the shovel's flood lights and provides overcurrent protection for the circuit.

18. **Windshield wiper control knob**

The windshield wiper control knob controls and regulates the speed of the wipers.

19. **Cab heater thermostat (optional)**

When the shovel is equipped with a thermostat, the thermostat regulates the temperature in the cab.

20. **Cab defroster switch (optional)**

When the shovel is equipped with a cab defroster switch, the switch controls the cab window defrosters.

21. **Run/off/test switch (house)**

The run/off/test switch is used mainly by maintenance electricians to test the control circuits without having to start the main AC motor.

When the switch is in the run position, the shovel starts and runs normally.

When the switch is in the off position, the shovel's starting and control circuits do not activate.

Caution:

Do not move the switch to the off position while the shovel is operating. This de-energizes the shovel's starting circuits and the main AC motor.

When the switch is in the test position, only the shovel's control circuits activate when the MG set start button is pushed. The starting circuits and the main AC motor do not energize.

22. Exciter breaker (house)

The exciter breaker provides overcurrent protection for the shovel's main exciter circuits. This breaker must be in the on position before the shovel starts.

Caution:

Do not move the breaker to the off position while the shovel is operating. This de-energizes the shovel's starting circuits and the main AC motor.

23. Auxiliary breaker (house)

The auxiliary breaker provides overcurrent protection for the shovel's auxiliary circuits (i.e., the blower motors, compressor, auto-lube systems, etc.). This breaker must be in the on position during operation.

24. Air compressor control switch (house)

The air compressor control switch is used to turn the compressor circuit on or off. This switch must be in the off position to service the compressor and must be in the on position during operation.

25. Upper frame grease system test button (house)

Depressing the upper frame grease system test button overrides the timer in the control panel and allows the system to be operated manually. This button is normally used to test for malfunctions.

26. Lower frame grease system test button (house)

Depressing the lower frame grease system test button overrides the timer in the control panel and allows the system to be operated manually. This button is normally used to test for malfunctions.

27. Open gear lube system test button (house)

Depressing the open gear lube system test button overrides the timer in the control panel and allows the system to be operated manually. This button is normally used to test for malfunctions.

28. Remote swing brake switch (outside)

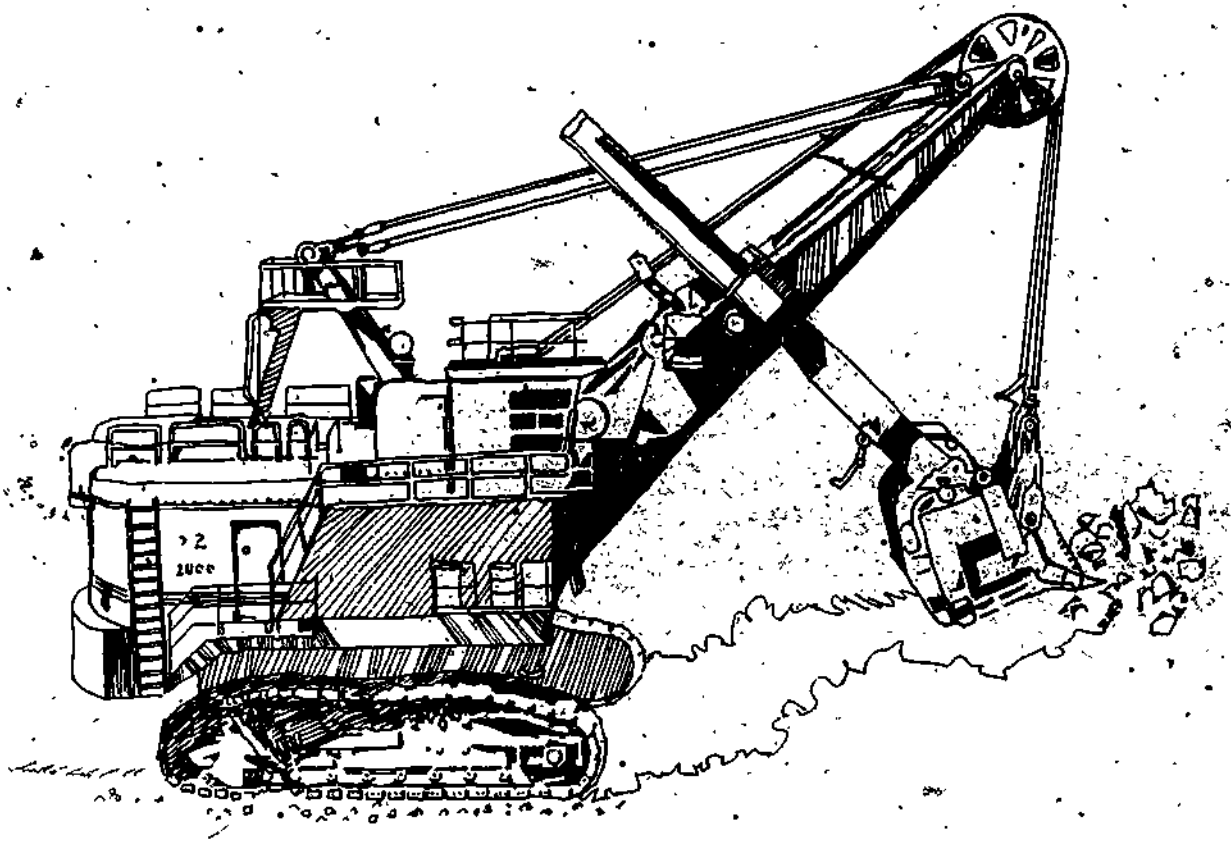
The remote swing brake switch is attached to the upper frame at the boarding ladder. It is activated by a tab attached to the boarding ladder. When the boarding ladder is pulled down the spring loaded switch opens the shovel's swing circuits and sets the swing brakes. When the ladder is pulled up the switch closes, allowing the swing circuits and brakes to operate.

Note:

This switch is intended as an emergency safety switch and should never be used to stop the shovel during normal operation.

PRE-START AND OPERATIONAL CHECKS

module 4



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OBJECTIVE 4-1

The shovel operator will locate and identify the basic units and related components on the shovel.

KEYPOINTS/PROCEDURES

1. **Basic units**

   The shovel is divided into three basic units to which all other units and components are attached. They are the:

   - Lower frame.
   - Upper (revolving) frame.
   - Boom assembly.

2. **Lower frame**

   The lower frame supports the upper (revolving) frame and the boom assembly. It consists of the:

   - Main car body.
   - Track frames.
   - Tracks.
   - Front idlers and rollers.
   - Propel shafts and drive tumblers.
   - Final drive gearcase.
   - Steering system.
   - Propel brakes (2).
   - Propel transmission.
   - Propel motor.
   - Power cable connector.
   - Low voltage collector assembly (transfers low voltage power from the lower frame to the upper frame).
   - High voltage collector (transfers high voltage power from the lower frame to the upper frame).
   - Center journal shaft (connects the upper and lower frames).
   - House rollers (between the upper and lower frames).
   - Main ring gear.

3. **Upper (revolving) frame**

   The upper frame is often referred to as the house. It is directly connected to the lower frame and supports the boom assembly. It also contains most of the shovel's operating machinery and supports the operator's cab. The upper frame contains and supports the:

   - Main AC motor.
   - Magnetorques.
   - Hoist gearing and gearcase.

- Hoist drum.
- Hoist cables (connects the hoist drum to the dipper over the boom point sheaves).
- Hoist brake.
- Chain generator drive and chaincase.
- Crowd/propel DC generator
- Swing DC generator.
- Swing motors (2).
- Swing transmissions (2).
- Swing shafts and pinions (2).
- Swing brakes (2).
- Electrical control cabinet.
- High voltage cabinet.
- Main transformer.
- Auto transformer.
- Auxiliary blower motors.
- Main blower motors.
- Air filtering system.
- Air compressor.
- Auto-lube system.
- Cab and controls.
- Gantry and equalizer assembly.
- Boom suspension cables (connects the boom point to the gantry).
- Boom foot pins and cushions (connects the bottom of the main boom to the upper frame).

4. **Boom Assembly**

The boom assembly is supported by the upper frame through the boom suspension cables and the boom foot pins. It supports the dipper and crowd assemblies. The boom assembly consists of the:

- Main boom.
- Boom point sheaves.
- Boom equalizer assembly.
- Crowd motor.
- Crowd motor blower hose (connects the crowd blower ~~motor to~~ the crowd motor).
- Crowd brake.
- Torque tube.
- Crowd transmission and shipper shaft.
- Crowd pinions and saddle blocks.

- Dipper sticks.
- Dipper.
- Dipper equalizer assembly.
- Dipper trip assembly.
- Dipper trip motor.
- Banjo lever and trip chain.
- Dipper trip cable (connects the trip motor and trip assembly through the banjo lever and trip chain).

OBJECTIVE 4-2

The shovel operator will locate in a systematic sequence the pre-start and operational check points.

KEYPOINTS/PROCEDURES

1. The shovel pre-start and operational check points are:
   - Check the cab for warning flags and read the logbook.
   - Claim the shovel.
   - Check the lockout station.
   - Arch and power cable.
   - Dipper assembly.
   - Boom foot pins and cushions.
   - Propel system.
   - Left track assembly.
   - Right track assembly.
   - House rollers.
   - Swing pinions and ring gear.
   - Bottom of the upper frame.
   - Boarding ladder and stairs.
   - Electrical cabinets.
   - Hoist drum and cables.
   - Hoist cable guide rollers (lower).
   - MG (motor generator) set.
   - Air compressor and receiver.
   - Hoist assembly.
   - Swing assemblies.
   - Auto-lube systems.
   - Main house.
   - Crowd assembly.
   - Dipper sticks.
   - Hoist cable guide rollers (upper).
   - Trip motor and cable.
   - Boom catwalks, ladders and platforms.
   - Boom suspension assembly.
   - Floodlights.
   - Cab.

OBJECTIVE 4-3

The shovel operator will perform a pre-start check of the shovel and describe both the acceptable conditions for each check point and the problems that should be reported to a supervisor.

KEYPOINTS/PROCEDURES

1. **Check the cab for warning flags and read the logbook**

   Before commencing the pre-start check, inspect the cab for other operators, warning flags, and read the previous entry in the logbook. Also check to ensure that there are no personnel working under or in the immediate vicinity of the shovel.

2. **Claim the shovel**

   Claim the shovel to ensure that no other operator moves it. Leave a visual indicator (lunch bucket or warning flag) to identify that the shovel is in use.

3. **Check the lockout station**

   Check the lockout station for lockout tags, padlocks or "do not operate" tags. If there is a tag at the station, do not attempt to start the shovel. Check with the supervisor for instructions.

4. **Arch and power cable**

   Check the arch and power cable for position and condition. Arrange to have the cable or arch moved, if necessary. Look for any bad cuts or bruises in the cable.

   Caution:

   Do not move or touch power cable without hot gloves.

5. **Dipper assembly**

   The dipper assembly should be checked for:

   - Worn or missing teeth, adapters or wear plates.
   - Missing or broken C clamps and wedges.
   - Loose or broken pins and keepers.
   - Hoist cable wear.
   - Excessive wear or adjustment in the trip assembly.
   - Adequate lubrication of snubbers (where applicable).
   - Worn or missing dutchman insert.
   - Excessive wear or cracks in the dipper or assembly.

6. **Boom foot pins and cushions**

   Check the boom foot pins and cushions for worn or missing parts. Check the boom for cracks and check the bottom half of the dipper sticks for condition and lubrication.

7. **Propel system**

   The propel system should be checked for:

   - The oil level in the propel transmission.
   - Oil and grease leaks.

- Loose mounting bolts or pins.
- Adequate lubrication of the jaw clutches and propel shafts.
- The adjustment and condition of the propel brakes.
- Excessive wear or cracks.

8. **Left track assembly**

   The left track assembly should be checked for:

   - The proper match of tumblers and track pads.
   - Loose or broken mounting bolts.
   - Broken or missing track pins.
   - Worn or cracked track pads.
   - Adequate lubrication of the rollers and shafts.
   - Grease leaks.
   - Excessive wear or cracks.

9. **Right track assembly**

   The right track assembly should be checked for:

   - The proper match of tumblers and track pads.
   - Loose or broken mounting bolts.
   - Broken or missing track pins.
   - Worn or cracked track pads.
   - Adequate lubrication of the rollers and shafts.
   - Grease leaks.
   - Excessive wear or cracks.

10. **House rollers**

    Check the house rollers for adequate lubrication and general condition. Check the roller path for foreign material.

11. **Swing pinions and ring gear**

    Check the swing pinions and ring gear for missing, broken or cracked teeth and adequate lubrication.

12. **Bottom of the upper frame**

    Check for obvious cracks and oil leaks. Check the house lights and lower floodlights. Inspect the condition of the remote air horn lever.

13. **Boarding ladder and stairs**

    Check the condition and cleanliness of the boarding ladder, stairs and handrails. Check the ladder's sliding path for lubrication and check the condition of the cables and pullies. Inspect the condition of the remote swing brake switch.

14. **Electrical cabinets**

    Inside the house, check all electrical cabinets for closed and locked doors. Check the exciter and auxiliary breakers and the run/test switch for correct position. Check for loose mounting bolts and for cracks.

Do not tamper with any electrical equipment. If there is a problem with the electrical equipment, notify a supervisor.

15. **Hoist drum and cables**

Check the general condition of the hoist drum and look for loose mounting bolts. Check the hoist cables for wear and to ensure they are not crossed on the hoist drum lagging. Check the hoist cable anchors.

16. **Hoist cable guide rollers (lower)**

Check the guide rollers for adequate lubrication, loose bolts and excessive wear.

17. **MG (motor generator) set**

Check all mounting bolts, couplings and guards. Look for oil leaks and check the oil level of the chaincase. Make a hand check of the motor and generators for excessive heat.

The chaincase has a safety switch that prevents the shovel from starting or shuts the shovel off when the oil level is too low for adequate lubrication.

18. **Air compressor and receiver**

Check all mounting bolts and guards. Check the oil level of the compressor and the condition of the belts. Drain the moisture from the receiver and check the air pressure reading.

Turn the compressor switch off before checking or servicing the compressor.

19. **Hoist assembly**

The hoist assembly should be checked for:

- Loose mounting bolts or guards.
- The oil level of the gear case.
- Oil leaks.
- Restricted oil flow (filter indicator).
- The adjustment and condition of the hoist brake.

20. **Swing assemblies**

The swing assemblies should be checked for:

- Excessive heat from the swing motors.
- The oil level of the transmissions.
- Oil leaks.
- Loose mounting bolts.
- The adjustment and condition of the swing brakes.

21. **Auto-lube systems**

Check the lubricant level in the three reservoirs. Check for broken or missing lines and look for leaks. Check the indicator lights for malfunctions. If the indicator light is on, do not operate the shovel. Check with a supervisor for instructions.

22. **Main house**

Check the house lights. Check the walkways for grease and oil spills and obstructions. Inspect the fire extinguisher and fire suppression system. Check to ensure that all of the doors are closed and latched properly for correct air circulation.

23. **Crowd assembly**

Check the crowd assembly for:

- Loose or missing mounting bolts, couplings or guards.
- Broken or missing lubricant lines.
- Adequate lubrication.
- Broken or missing teeth on the crowd pinion.
- Loose nuts or keepers on the dipper shaft.
- Oil or grease leaks.
- The oil level in the crowd transmission.
- The adjustment and condition of the crowd brake.
- The condition of the crowd motor blower hose.

24. **Dipper sticks**

Check the dipper sticks for loose, broken or missing teeth. Check for adequate lubrication and for cracks.

25. **Hoist cable guide rollers (upper)**

Check the guide rollers for adequate lubrication, loose bolts and excessive wear.

26. **Trip motor and cable**

Check the trip motor for loose or missing bolts. Check the condition of the trip cable and pulley.

27. **Boom catwalks, ladders and platforms**

Check the catwalks, ladders and platforms for broken welds, missing bolts, cracks, loose or missing handrails and for cleanliness.

28. **Boom suspension assembly**

Check the boom suspension assembly for:

- Loose, worn or broken suspension cables.
- Loose or missing pins or keepers.
- Adequate lubrication.
- Obvious cracks.

29. **Floodlights**

Check the floodlights for loose mounting bolts, proper positioning and operation.

30. **Cab**

Check the cab windows and mirrors for their condition and visibility. Check the fire extinguisher and adjust the operator's seat for personal comfort.

OBJECTIVE 4-4

The shovel operator will perform shovel start up and shut down procedures.

KEYPOINTS/PROCEDURES

1. **Start up**

Follow these procedures to start the shovel:

a. Perform all pre-start checks (Objective 4-3).

b. Ensure that all of the rotating machinery is clear and that all personnel in the house are warned of the start up. Ensure that all blind areas of the shovel are clear of personnel and equipment.

c. Raise the boarding ladder and ensure that it closes the remote swing brake switch.

d. Ensure that all breakers and switches are in their normal operational positions.

e. Ensure that the main air pressure gauge has a minimum reading of 105 psi.

f. Ensure that the crowd/propel transfer switch is in the crowd position.

g. Ensure that the swing brake switch is in the on position.

h. Press and release the MG set start button. The MG set takes approximately one minute to fully start. Be alert for any unusual noises or vibrations during the starting sequence.

i. Check the ground fault indicator light.

j. Check the AC (approximately 440 volts) and DC (approximately 150 volts) voltmeters for proper voltage.

k. Check the oil pressure (approximately 12 psi) of the chaincase lubrication pump.

l. Sound one long blast on the air horn before releasing the brakes and moving the shovel.

Limit the MG set to three starts per hour, spaced not less than one minute apart to prevent heating damage to the starting auto-transformer. Whenever three starts are made in a one hour period, wait one additional hour after the third start before restarting.

2. **Shut down**

Follow these procedures to shut down the shovel:

a. Position the shovel on solid ground and in a clear area, where it cannot be damaged by sloughing rocks.

b. Set the dipper on the ground and apply the hoist/crowd brake.

c. Apply the swing and propel brakes.

d. Press the MG set stop button. Be alert for any unusual noises or vibrations as the MG set winds down.

e. Make a visual check of the house and a hand check of the main motors.

f. Ensure that the logbook is filled out.

Caution:

Use caution when climbing down off of the shovel. Extend the ladder fully and use all of the steps and handholds provided.

OBJECTIVE 4-5

The shovel operator will perform operational checks on the propelling, swinging and digging brakes and controls.

KEYPOINTS/PROCEDURES

1. Before performing the operational checks on the shovel the operator must complete the pre-start checks (Objective 4-3) and the start up procedures (Objective 4-4). The operator must also re-check the blind areas surrounding the shovel for other personnel and equipment.

2. **Propelling**

   Perform these operational checks:

   a. Follow steps one to seven of Objective 5-5 to perform propel motion control.

   b. Slowly move the shovel forward and then in reverse propel for a short distance.

   c. Place the steering switch in left steer and steer forward and then reverse for a short distance.

   d. Place the steering switch in right steer and steer forward and then reverse for a short distance.

   e. Listen for any squealing or rattling of the propel brakes to indicate poor adjustment.

   f. Check for proper drive tumbler to track engagement.

   g. Be alert for any unusual noises or vibrations.

   h. Note any tendency of the controls to jam or hang up.

   i. Report any problems to a supervisor.

3. **Swinging**

   Perform these operational checks:

   a. Hoist the dipper to truck height and set the hoist/crowd brake.

   b. Release the swing brake and position the cab facing forward.

   c. Swing the shovel three or four times in 50° to 60° swing arcs, testing the response of the swing pedals.

   d. Swing the shovel 360° to rotate the house rollers.

   e. Re-test the response of the swing pedals with a full dipper.

   f. Be alert for any unusual noises or vibrations.

   g. Note any tendency of the controls to jam or hang up.

   h. Report any problems to a supervisor.

4. **Digging**

   Perform these operational checks:

   a. Position the shovel at the work face.

   b. Release the hoist/crowd brake and the swing brake.

   c. Hoist, lower, crowd and retract the empty dipper three or four times, testing the response of the controls.

d. Fill the dipper and slowly re-test the response of the controls.

e. Test the holding power of the hoist and crowd brakes with a full dipper.

f. Be alert for any unusual noises or vibrations.

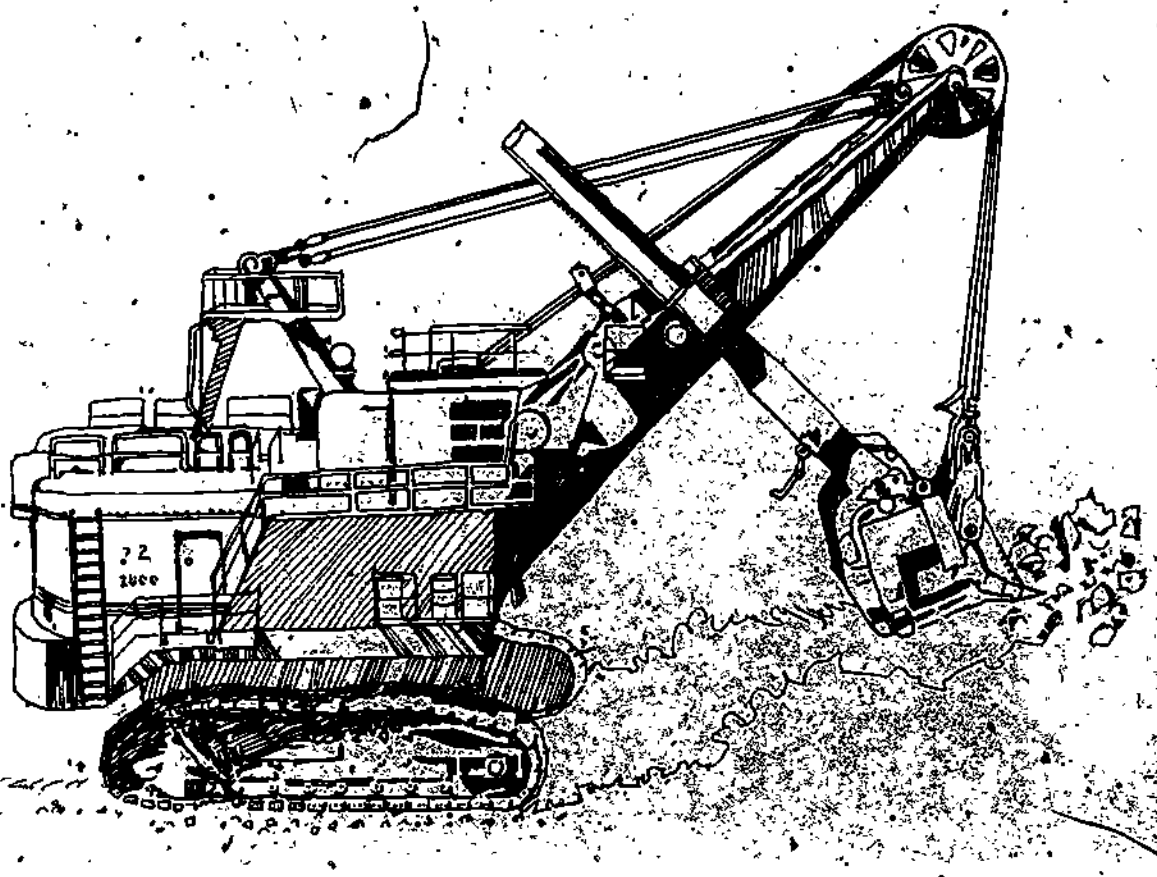
g. Note any tendency of the controls to jam or hang up.

h. Report any problems to a supervisor.

5. After checking the propelling, swinging and digging motions, the shovel operator should operate with light dippers for the first 10 to 15 minutes. After this period, the operator should check all of the motors and brakes for overheating.

BASIC OPERATION

module 5



ERIC

OBJECTIVE 5-1

The shovel operator will demonstrate control of the hoisting and lowering motions of the dipper.

KEYPOINTS/PROCEDURES

1. The shovel operator must closely control the hoist power requirements of the shovel while operating. Follow these procedures to develop the control:
   a. Position the shovel with the dipper in a clear area.
   b. Set the swing brake.
   c. Use the crowd controller to prevent the dipper sticks from crowding or retracting.
   d. Slowly lower the dipper until the dutchman is just above ground level (approximately one foot).
   e. Slowly raise the dipper until the dipper sticks are horizontal.
   f. Repeat these procedures, gradually building up speed until smooth hoist control, stopping and holding at ground level and stopping and holding at horizontal are mastered.

   Caution:

   Caution must be used while operating, to avoid overhoisting the dipper or allowing slack in the hoist cables when the dipper contacts the ground. Overhoisting can cause damage to the equalizer assembly or to the boom point sheaves. Allowing slack in the hoist cables can cause them to cross on the hoist drum.

2. To stop or reverse the direction, when hoisting or lowering the dipper, reverse the direction of the controller. The hoist brake is not to be used as a braking device except as a holding brake or in an emergency. When being used as a holding brake, the motion must be stopped before the brake is applied.

OBJECTIVE 5-2

The shovel operator will demonstrate control of the co-ordinated hoist/crowd motion of the dipper.

KEYPOINTS/PROCEDURES

1. The shovel operator must closely co-ordinate the hoist and crowd motions in order to control the dipper while operating. Follow these procedures to develop the co-ordination.
   a. Position the shovel at the face approximately four feet back from a normal digging position.
   b. Set the swing brake.
   c. Position the dipper with the dipper sticks horizontal and the dipper teeth approximately two feet from the face.
   d. Slowly lower the dipper until the dipper teeth contact the toe of the face, using the crowd controller to maintain the two foot distance.
   e. Slowly hoist the dipper until the dipper sticks are horizontal, using the crowd controller to maintain contact between the dipper teeth and the face.
   f. Repeat these procedures, gradually building up speed, until smooth hoist/crowd control, maintaining the two foot distance, and maintaining contact with the face are mastered.
2. **Overcrowding**

   Caution must be used while operating to avoid overcrowding. Overcrowding, with the dipper lowered, can result in jacking the boom. The jacking action can result in damage to the boom suspension cables or to other related boom components. If the boom is jacked slightly, it contacts the first stage of the boom limit safety switch. This causes the controller to automatically reverse its function until the boom returns to its normal position and the switch is clear. If the boom is jacked or snapped back suddenly, beyond the first stage of the boom limit safety switch, the shovel's DC power completely shuts down. Overcrowding, with the dipper in the face, slows up the dipper loading process through increased resistance, thereby reducing digging efficiency.
3. **Crowd limits**

   If the operator crowds or retracts the dipper sticks beyond their operating limits, the controller automatically reverses its function and brings the dipper sticks back within operational limits.
4. To stop or reverse the direction when crowding or retracting the dipper sticks, reverse the direction of the controller. The crowd brake is not to be used as a braking device except as a holding brake or in a emergency. When being used as a holding brake, the motion must be stopped before the brake is applied.

OBJECTIVE 5-3

The shovel operator will demonstrate control of the swing motion of the shovel.

KEYPOINTS/PROCEDURES

1. The shovel operator must closely control the swing motion of the shovel at all times. Follow these procedures to develop the control:
   a. Position the shovel in a clear area.
   b. Make three marks on the ground; one directly in front of the shovel, one 90° to the left and one 90° to the right.
   c. Hoist the dipper approximately six feet off of the ground. Position it above the front mark and set the hoist/crowd brake.
   d. Slowly swing the shovel 90° to the right, bringing the dipper to a stop above the right mark. Slowly swing back and bring the dipper to a rest over the front mark.
   e. Repeat these procedures, gradually building up speed, until smooth swing control and stopping and holding over the desired mark are mastered.
   f. Follow the same procedures, using the right and left marks, to master a 180° swing and repeat until proficient.
   g. Follow the same procedures, using the front mark only, to master a 360° swing and repeat until proficient.
2. To stop or reverse the direction when swinging, depress the opposite swing pedal. The swing brake is not to be used as a braking device except as a holding brake or in an emergency. When being used as a holding brake, the motion must be stopped before the brake is applied.

OBJECTIVE 5-4

The shovel operator will demonstrate control of the co-ordinated hoist/crowd/swing motion of the shovel.

KEYPOINTS/PROCEDURES

1. The shovel operator must closely co-ordinate the hoist, crowd and swing motions of the shovel in order to operate both safely and productively. Follow these procedures to develop the co-ordination:

   a. Position the shovel at the face approximately four feet back from a normal digging position.

   b. Select an imaginary digging point directly in front of the shovel and an imaginary truck position 90° to the left.

   c. Position the dipper at truck height over the selected truck position.

   d. Slowly swing to the right, lowering and retracting the dipper, until the dipper teeth contact the toe of the face at the selected digging point.

   e. Slowly hoist the dipper until the truck height is reached, using the crowd controller to maintain contact between the dipper teeth and the face.

   f. Slowly swing back to the left, crowding or retracting if necessary, and bring the dipper to a stop over the selected truck position. The dipper should be tripped as it swings into the truck before it is stopped.

   g. Repeat these procedures, gradually building up speed, until smooth hoist/crowd/swing control, contacting the toe at the selected digging point and stopping over the selected truck position are mastered.

OBJECTIVE 5-5

The shovel operator will demonstrate control of the propelling motions of the shovel.

KEYPOINTS/PROCEDURES

1. The life expectancy of the propel machinery is directly dependent upon the operator's skill while propelling or steering the shovel. Follow these procedures when propelling the shovel:
   a. Ensure that the area is clear of personnel and equipment in the desired direction of travel.
   b. Ensure that the trailing cable is clear.
   c. Position the dipper at truck height and set the hoist/crowd brake.
   d. Position the operator's cab in the desired direction of travel and in a position for the operator to observe the front of one track. Set the swing brake.
   e. Check the steering toggle switch to ensure that it is set in the center off position.
   f. Move the crowd/propel transfer switch to the propel position. When transferring from crowd to propel, or vice versa, a pause of a few seconds is required to ensure that the respective brakes have disengaged or engaged and that all of the controls have sequenced and are operative.
   g. Slowly move the controller in the direction opposite the desired direction of travel until the shovel has moved approximately one foot. This ensures proper jaw clutch engagement.
   h. Slowly move the controller in the desired direction of travel. The further the controller is moved the faster the shovel travels until its maximum speed is reached. To stop the shovel, allow the controller to return to the neutral position.
2. Whenever possible, propelling should be done in a forward direction. Reverse propelling should be kept to a minimum to reduce wear to the propel machinery.

OBJECTIVE 5-6

The shovel operator will demonstrate control of the steering motions of the shovel.

KEYPOINTS/PROCEDURES

1. The life expectancy of the propel machinery is directly dependent upon the operator's skill while propelling or steering the shovel.

2. **Left steer**

   Follow these procedures to steer the shovel to the left.

   a. Follow steps one to six given in Objective 5-5.

   b. With the controller handle in the neutral position, move the steering toggle switch to the left steer position. This disengages the left male jaw clutch and engages the left propel brake.

   c. Slowly move the controller handle backwards until the shovel has moved in reverse approximately one foot. This ensures proper jaw clutch engagement.

   d. Slowly move the controller handle forward until the shovel has turned the desired amount. To stop the shovel, allow the controller handle to return to the neutral position.

   e. Move the steering toggle switch back to the center off position and move the controller handle slightly in both directions to engage the jaw clutches before propelling.

3. **Right steer**

   Follow these procedures to steer the shovel to the right.

   a. Follow steps one to six given in Objective 5-5.

   b. With the controller handle in the neutral position, move the steering toggle switch to the right steer position. This disengages the right male jaw clutch and engages the right propel brake.

   c. Slowly move the controller handle backwards until the shovel has moved in reverse approximately one foot. This ensures proper jaw clutch engagement.

   d. Slowly move the controller handle forward until the shovel has turned the desired amount. To stop the shovel, allow the controller handle to return to the neutral position.

   e. Move the steering toggle switch back to the center off position and move the controller handle slightly in both directions to engage the jaw clutches before propelling.

4. All turns should be restricted to a maximum of 20 degrees. If a turn of more than 20 degrees is necessary, the turn should be made in a series of short increments of 15 to 20 degrees. In between each short turn the shovel should be propelled a short distance to clear the tracks and drive tumblers of rocks and debris.

5. **Reverse steer**

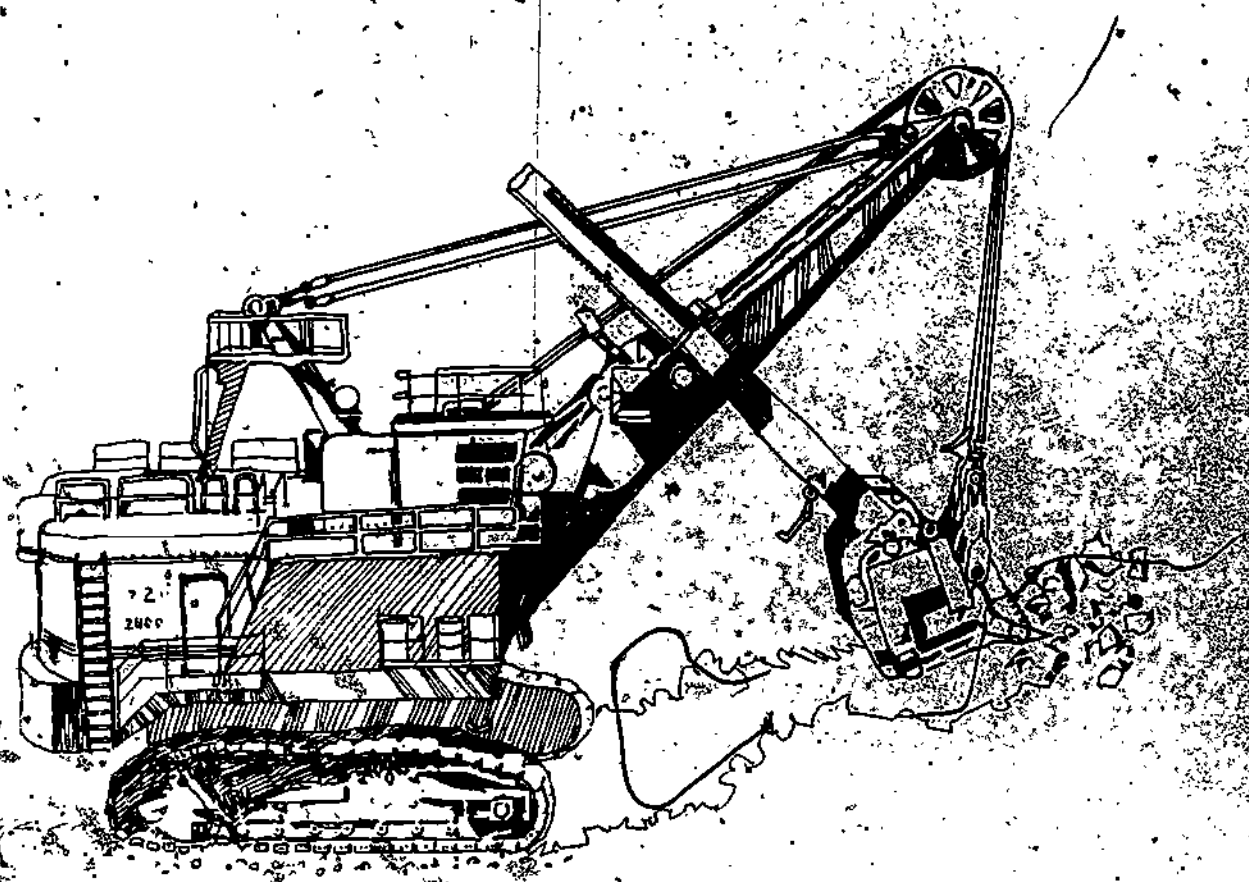
   To reverse steer the shovel follow the same procedures as in normal steering except place the steering toggle switch in the opposite steering mode (i.e., to make a left turn in reverse, place the steering toggle switch in the right steer position and to make a right turn in reverse place the steering toggle switch in the left steer position).

   Note:

   Whenever possible, steering should be done in forward propel. Reverse steering should be kept to a minimum to reduce wear on the propel machinery.

SHOVEL PRODUCTION

module 6



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OBJECTIVE 6-1

The shovel operator will demonstrate proper digging techniques for loose or blasted material.

KEYPOINTS/PROCEDURES

1. The shovel operator must use proper digging techniques during the loading cycle, to gain maximum production with a minimum of shovel effort. Follow these techniques for digging loose or blasted material:

   a. The shovel must be as level as possible. If necessary, use the dipper to level an area for the shovel before beginning to dig.

   b. The shovel must be positioned close enough to the work face so that the major portion of the digging is performed directly under, or slightly beyond the boom point. The dipper rise, through the face, must be as close to vertical as possible to make maximum use of the available hoist force. If digging is attempted with the shovel positioned too far forward, or too far back, the face penetration is minimal and the hoist force is dissipated by the hoist and crowd forces opposing each other rather than working together.

   c. The dipper should enter the toe of the face just under or slightly behind the boom point and, using crowd thrust, should be forced under enough material to make effective use of the available hoist force. There is a direct relationship between the crowd depth of face penetration and the distance the dipper must rise in the face to fill. The deeper the bite the quicker the dipper is filled, provided that the hoist force is sufficient to cut the column of material.

   d. The crowd penetration should be rapid at the point of entry and rise as the dipper enters the face. This permits as much digging as possible near the toe of the face.

   e. To maintain a level grade while digging, the dipper should enter the toe of the face at the tangent point between the face and the pit floor and should travel horizontally while penetrating.

   f. When entering the face, it is important to ensure that the full cutting surface of the dipper contacts the face. The speed at which the dipper fills is directly related to the amount of material entering the dipper throat. A full face cut combined with deep face penetration results in filling the dipper with the least amount of rise.

   g. The crowd thrust should be maintained, to hold the dipper in the face while hoisting. As soon as the dipper is full, retract it from the face to load the truck. Do not swing until the dipper has cleared the face.

   h. Dig in a planned sequence, beginning as close as possible behind the spotted haul truck and progressively working away from the truck with each successive pass. (See Objective 6-9).

   i. Advance the shovel, as necessary, to keep digging under the boom point.

2. In all types of digging, the operator must carefully control the desired depth of cut and the hoist power requirements to avoid stalling the dipper in the face. The life expectancy of the hoist machinery and the hoist cables is directly dependent upon the operator's skill in avoiding stalls.

OBJECTIVE 6-2

The shovel operator will demonstrate the proper procedures for spotting haul trucks.

KEYPOINTS/PROCEDURES

1. The proper spotting of haul trucks is essential for the safety and efficiency of the loading operation. Follow these procedures for spotting haul trucks:
   a. Position the shovel as level as possible and correctly for digging. (See Objective 6-1).
   b. Check to ensure that there is no spill rock in the desired loading position. If there is too much spill rock in the loading position, load from the opposite side until the spill rock has been cleaned up.
   c. Fill the dipper. (For the most efficient production, the first dipperful is normally taken from the remotest point in the swing arc.)
   d. Spot the dipper over the desired loading position and set the hoist/crowd brake. When spotted, the dipper should be positioned so that it is in the center of the truck box after the truck is properly positioned. This allows the driver to use it as a guide while backing into position.
   e. The haul truck should be positioned so that its center line is approximately under or only slightly beyond the swing path of the boom point. This minimizes the amount of dipper maneouvering required to load the truck. Spotting the haul truck inside or outside of the boom point swing path requires the operator to retract or crowd the dipper to load the truck. This breaks the operator's rhythm and increases the length of time required to complete the load.
   f. As the truck backs under the dipper, release the hoist/crowd brake. When the truck reaches the proper position, signal it to stop by blowing the horn or by tripping the dipper. Trip the dipper carefully. Don't drop or throw the material into the truck box. If the truck spots incorrectly, or if the shovel moves forward causing the boom point swing path to change, the truck must be repositioned to the proper loading position.

Caution:

Never suspend a loaded or empty dipper in the air for long periods. Set the dipper on the ground if the shovel is to be idle for any length of time. The only time it is permissable to suspend a loaded dipper is while spotting a haul truck. Never swing the dipper, loaded or empty, over personnel or equipment.

OBJECTIVE 6-3

The shovel operator will demonstrate the proper procedures for loading haul trucks.

KEYPOINTS/PROCEDURES

1. Loading haul trucks is the primary function of the shovel. The following procedures must be co-ordinated with other applicable tasks to gain an efficient loading cycle:
   a. Position the shovel as level as possible and correctly for digging. (See Objective 6-1).
   b. Spot the truck correctly. (See Objective 6-2).
   c. The first dipperful, used to spot the truck, should be taken from the remotest point in the swing arc.
   d. Dig in a planned sequence, beginning as close as possible behind the spotted haul truck and progressively working away from the truck with each successive pass. Digging in a planned sequence is extremely important to the efficiency of the loading cycle. A planned sequence gives the operator the knowledge of where the next dipperful is coming from, allows smooth short loading cycles, and eliminates excessive crowd and retract motions caused by uneven face surfaces. It also aids the operator in maintaining a clean, level floor and keeps the area behind the haul trucks free of obstacles.
   e. Build the load in the truck box uniformly.
   f. Trip the dipper as it swings into the truck box to allow a reverse swing against an empty bucket rather than a full one.
   g. Maintain smooth swing motion control at all times. Erratic swing motion control, while loading, can result in excessive spill rock, excessive maintenance to the shovel and damage to the haul truck or driver.
   h. Advance the shovel, as necessary, to keep digging under the boom point.
   i. Do not allow the swing arc to exceed 90° during the loading cycle. The time expended for accelerating and decelerating the swing represents the greater part of the loading cycle. Therefore, swing arcs must be kept to a minimum to gain maximum operating efficiency.
   j. Keep the working face clear of projections.
   k. Do not overload the truck.
2. The shovel operator must be constantly aware of the possibility of another piece of equipment entering the swing radius of the shovel. Severe damage or injury can result from the shovel striking another piece of equipment.

OBJECTIVE 6-4

The shovel operator will demonstrate the proper positioning of the shovel in relation to the work face.

KEYPOINTS/PROCEDURES

1. There are two basic methods for positioning a shovel at a work face; the frontal approach and the parallel approach. The frontal approach is the method most commonly used in mining operations. This method allows loading on either side of the shovel and is more efficient than the parallel approach. The parallel approach only allows for loading on one side of the shovel and is commonly used for low faces or face contouring operations. However, circumstances can make the parallel method the most practical for a particular application. Follow these procedures for the frontal approach:

   a. Initially, the shovel should be positioned squarely on the most prominent bulge on the front of the working face.

   b. Advance the shovel, as necessary, to keep digging under the boom point.

   c. Spot and load trucks on alternate sides of the shovel to allow a haul truck to spot on one side while the shovel loads on the other.

   d. Keep the shovel centered squarely to the work face to allow an equal amount of digging for both sides.

   e. Dig in this position until the point is reached where a 90° swing arc to either side is required to load the haul trucks. This results in a full cut of approximately 180°.

   f. Reposition the shovel to a new cut alongside of the first one.

   g. Repeat these procedures working the face evenly, until the digging limits have been reached.

   h. Do not allow the swing arc to exceed 90° during the loading cycle.

   i. Maintain a clean and level working area at all times.

   Note:

   All shovel moves must be planned out before the move begins. This allows the operator to have the cable or arch prepared prior to moving, and keeps the propelling and steering motions to a minimum during the move.

2. Follow these procedures for the parallel approach:

   a. Position the shovel with the shovel tracks parallel to the work face.

   b. Position the inside edge of the outer set of shovel tracks so that it is directly in line with the toe of the work face.

   c. Advance the shovel, as necessary, to keep digging under the boom point.

   d. Do not allow the swing arc to exceed 90° during the loading cycle.

   e. The depth of the cut can be varied by positioning the shovel tracks further outboard as desired. Deeper cuts should be avoided as they require occasional repositioning of the shovel and create excessive swing arcs.

OBJECTIVE 6-5

The shovel operator will demonstrate the proper techniques for maintaining a clean level pit floor.

KEYPOINTS/PROCEDURES

1. A clean level pit floor is necessary for safe and stable machine operation, and reduces maintenance to drive components. Follow these procedures to maintain a clean level pit floor:

   a. The pit floor should be cleaned and levelled prior to the shovel moving into position. This task is normally performed by a dozer, but can be accomplished by using the shovel dipper when necessary.

   b. Dig in a planned sequence, beginning as close as possible behind the spotted haul truck and progressively working away with each successive pass. This allows the material a space in which to fall. When the face sloughs, restart the digging sequence at the point of the slough that is closest to the spotted truck.

   c. The dipper should enter the toe of the face at the tangent point between the face and the pit floor. Undercrowding or overcrowding when entering the face, creates an uneven pit floor.

   d. The hoist and crowd motions must be correlated to allow the dipper to travel horizontally while penetrating the toe of the face.

   e. Advance the shovel as necessary to keep digging under the boom point. Digging with the shovel positioned too far back from the working face prevents the dipper from travelling horizontally when entering the face.

   f. Clean the pit floor, as necessary, before advancing into the face. Where required, reverse the shovel a few feet to clean the material which has rolled down from the face and become lodged directly in front of the tracks or carbody. Do not sweep the pit floor with the dipper. Placing the dipper on the pit floor and swinging sideways is referred to as sweeping. Using this procedure to clean the pit floor places excessive strain on the dipper, dipper sticks, and other boom components.

   g. The waiting time between trucks can be used to clean or level the pit floor with the dipper.

   h. The use of a dozer, when available, aids in maintaining a clean level loading area for the haul trucks and in keeping the tails pushed in at the extremities of the swing arc.

2. The shovel operator should always check with the supervisor, at the beginning of the shift, to determine how the shovel should be advancing to maintain planned bench grades. It may be necessary to work the shovel on a slight uphill or downhill grade, in order to return the bench to the proper elevation.

OBJECTIVE 6-6

The shovel operator will demonstrate the proper digging techniques for hard materials.

KEYPOINTS/PROCEDURES

1. Hard digging applies to the digging of materials, blasted into interlocking chunks and fines that are difficult to pull loose from the face, free digging of conglomerate overburden, and the facing up of material for reblasting, etc. When digging hard materials the dipper averages less than a full load because of the larger chunks that hinder the pickup of smaller pieces or the interlocking action of the material which increases the resistance against flow. Follow these procedures for hard digging:

   a. Select the best approach. A parallel approach is commonly used for facing up to avoid constant repositioning. (See Objective 6-4).

   b. Position the shovel as level as possible and correctly for digging. (See Objective 6-1).

   c. Dig in a planned sequence beginning as close as possible behind the spotted haul truck and progressively working away from the truck with each successive pass. A disorganized digging sequence creates an uneven face surface which results in a difficult face to work effectively. (See Objective 6-3).

   d. The dipper should enter the toe of the face just under or slightly behind the boom point. (See Objective 6-1).

   e. Approximately one-third to two-thirds of the dipper width should be used to cut the face, depending on the digging conditions. This allows the dipper to shave the material off of the face and aids the flow of the material into the dipper.

   f. Maintain close hoist/crowd motion control. Often hard digging requires the hoist or crowd motions to maneouver around oversized or lodged obstructions in the work face.

   g. For very hard digging, move the shovel closer to the face and remove the softer top material first. This is accomplished by lowering the dipper until the door closes, then entering the face at approximately truck height. The material can then be loaded directly onto a haul truck. When a full cut of the face has been made, move the shovel back and remove the material at the toe.

   h. If the face is solid or frozen, move the shovel closer to the face. Start from the top and work down across the face scaling the material with the dipper. The dipper door should be open while scaling. When a full cut has been made, move back and load out the loosened material. Do not attempt to dig from the bottom of a solid face.

   i. The waiting time between trucks can be used to scale the face.

   j. Do not leave overhangs that can endanger personnel or equipment.

   k. When loading large material, cushion the load by placing some fine material in the truck box first. Don't drop or throw the dipper loads into the truck box.

2. In all types of digging, but especially in hard digging situations, the operator must carefully control the desired depth of cut and the hoist power requirements, to avoid stalling the dipper in the face. The life expectancy of the hoist machinery and hoist cables is directly dependent upon the operator's skill in avoiding stall conditions.

OBJECTIVE 6-7

The shovel operator will demonstrate proper digging techniques for low faces.

KEYPOINTS/PROCEDURES

1. Low faces are usually caused by material being spread from blasting but they can also be caused by dozers pushing material, the digging of old ramps, etc. The dipper normally averages less than a full load because there is less material within reach of the dipper or the dipper tends to push the material instead of picking it up. Follow these procedures for digging low faces:

   a. Select the best approach. A parallel approach is commonly used for low faces but it may be necessary to use a frontal approach initially. (See Objective 6-4.)

   b. Position the shovel as level as possible and correctly for digging. (See Objective 6-1.)

   c. Dig in a planned sequence beginning as close as possible behind the spotted haul truck and progressively working away from the truck with each successive pass. (See Objective 6-3.)

   d. The dipper should enter the toe of the face at the tangent point between the face and the pit floor.

   e. The full cutting surface of the dipper should be used to cut the face.

   f. The hoist/crowd motions must be closely controlled to allow the dipper to travel horizontally for its maximum distance (approximately seven to eight feet) when entering the face. This allows the maximum amount of material to enter the throat of the dipper and aids in maintaining a level grade.

   g. Make one full cut across the face and then advance the depth of the cut and repeat.

   h. The planned use of a dozer to keep the tails pushed in at the extremities of the swing arc increases the amount of digging that can be done from one location by reducing the swing arc. This greatly reduces the amount of repositioning necessary to work the face.

   i. The waiting time between trucks can be used to push or pile the material into a higher face with the dipper.

   j. Plan the digging and the shovel positions in advance to allow the face to be worked in evenly. When digging low faces, it is necessary to make a long-term digging plan of the entire face. A low face not worked in evenly, results in long tails and a difficult face to work effectively.

OBJECTIVE 6-8

The shovel operator will demonstrate the proper techniques for moving the shovel.

KEYPOINTS/PROCEDURES

1. Follow these procedures to move the shovel:

   a. Plan the move. All shovel moves require advance planning to ensure a safe and efficient move.

   b. Check the area over which the shovel is to travel and select the shortest, most stable route.

   c. Select hard, level or raised ground for steering. Do not steer the shovel in soft material or hollows.

   d. Discuss the moving plan with the ground personnel.

   e. Prepare the trailing cable or arch in advance. Where possible, move the arch and slack trailing cable before the shovel is moved.

   f. Signal the move to persons on or near the shovel.

   g. Empty the dipper and clean the dipper teeth prior to moving. Never swing the dipper, loaded or empty, over personnel or equipment.

   h. Keep the move as short as possible.

   i. Keep reverse propelling and steering to a minimum.

Caution:

Do not move the shovel if the lower greasing system is inoperative. Severe damage to the propel machinery can occur from lack of proper lubrication.

OBJECTIVE 6-9

The shovel operator will demonstrate the proper maintenance of the shovel's working area.

KEYPOINTS/PROCEDURES

1. The shovel operator must supervise or assist in the supervision of the shovel's working area to maintain a safe, efficient operation. This involves the positioning of the arch and power cable and the planned use of dozers in the shovel's loading area for cleanups, pushing in tails and the preparation of the shovel's next digging position.

2. **Arch and power cable position**

   Follow these procedures to position the arch and power cable:

   a. Place the arch on solid, level ground and position it to allow the smoothest and easiest path for hauling.

   b. Place the power cable on dry ground and position it out of the normal path of haul trucks. The cable should also be well marked with cable horses.

   c. Place the slack power cable out of the shovel's immediate working area and be sure that it is properly coiled.

   d. Place sufficient slack cable (approximately 40 feet) directly behind the shovel to allow the shovel to maneouver at the face.

   e. When the shovel repositions at the work face, the arch or power cable should also be repositioned if necessary, to maintain a safe and efficient working area.

3. **Loading areas**

   Follow these procedures to maintain the loading areas:

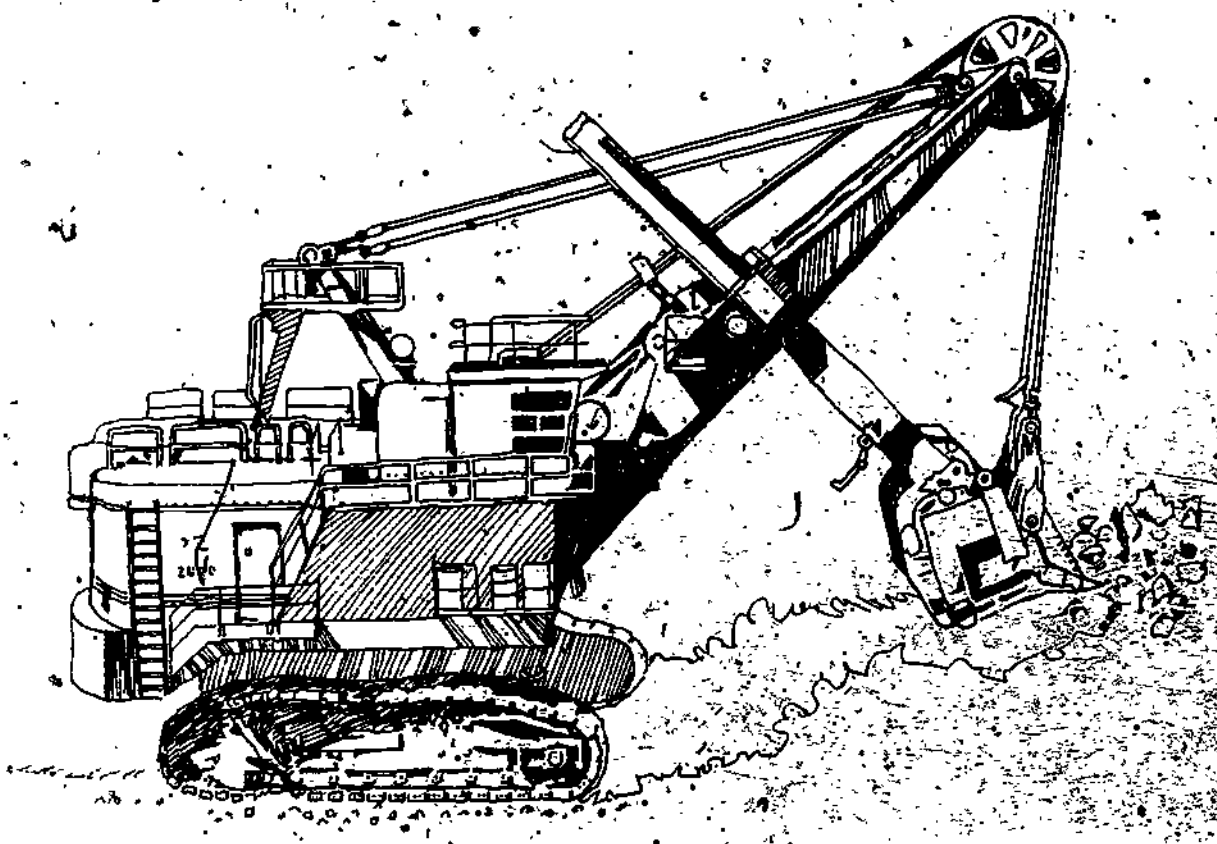
   a. The shovel operator must arrange for a cleanup of the loading area as often as necessary, to keep the area level and clear of spill rock.

   b. When available, the planned use of a dozer to keep the tails pushed in at the extremities of the swing arc increases the amount of digging that can be accomplished from one location. This increases the efficiency by reducing the amount of repositioning necessary to work the face.

   c. Whenever possible, the shovel operator should select the shovel's next digging position in advance and arrange for the cleaning and levelling of the site before repositioning.

LUBRICATION AND SERVICE

module 7



ERIC

OBJECTIVE 7-1

The shovel operator will demonstrate knowledge of the automatic lubrication systems of the shovel.

KEYPOINTS/PROCEDURES

1. The automatic lubrication systems provide the proper distribution of lubricants to the majority of the shovel's components at pre-determined intervals. Lubrication is vital to prolong the life of the components. The shovel operator must be knowledgeable in the operation of the automatic lubrication systems in order to spot and report problems.

2. The shovel has three basic auto-lube systems, each having the same basic components. The first system is for an open gear lube and lubricates the dipper sticks, crowd pinions, swing pinions and ring gear. The second system lubricates the component parts in the upper frame with multi-purpose grease and the third lubricates the component parts in the lower frame with multi-purpose grease.

3. A single auto-lube system normally consists of the:

   - Lubricant reservoir — The lubricant reservoir stores the supply of lubricant for the pump.
   - Lubricant pump — The pump is air operated and pumps lubricant through the supply lines.
   - Air and lubricant supply lines — These lines carry the air and lubricant to the designated points.
   - Control panel — The control panel contains the electric timers which activate the system and determine the length of time between cycles. It also contains the alarm system which signals a malfunction and a button for manually operating the pump.
   - Air pressure regulator — This regulates the amount of air pressure to the pump. Depending upon the ratio of the pump, the regulator determines the lubricant pressure that the pump delivers. The pressure gauge on the regulator registers the regulated air pressure.
   - Solenoid valve — The solenoid valve is actuated by the timer in the control panel. It opens on command, allowing air to pass through to the pump and vent valve.
   - Vent valve — When the vent valve receives air from the solenoid valve it opens to allow lubricant to flow to the injectors. When the air supply is stopped it returns the excess lubricant to the reservoir.
   - Injectors — The injectors meter the amount of lubricant going into the bearings. They are normally mounted in manifolds, located near the bearings that they service.
   - Pressure switch — The pressure switch signals the control panel when sufficient pressure has built up in the system. This stops the cycle. It is generally located near the injectors.
   - Air filter lubricators — The air filter lubricators consist of a filter to collect the moisture from the air supply and a lubricator to supply an airborne mist of oil to lubricate the pump.

4. A normal autolube cycle operates as follows:

   a. The timer actuates the solenoid valve causing it to open and allow air to pass to the pump and vent valve.

   b. The pump starts pumping lubricant and, at the same time, the vent valve opens to allow the lubricant to flow to the injectors.

   c. The injectors block the flow of lubricant until the pressure builds up to approximately 1700 psi. When the pressure has built up, the injector allows a metered amount of lubricant to pass through to the bearing. Only the metered amount of lubricant passes through the injectors so that the pressure continues to build until the pre-determined pressure is reached.

   d. When sufficient pressure is built up, the pressure switch signals the control panel.

   e. The control panel de-activates the solenoid valve which, in turn, closes the air supply to the pump and vent valve.

   f. The pump stops and the vent valve closes allowing the lubricant under pressure to reutrn to the reservoir. If the pressure is not relieved, the injectors cannot reset for the next cycle.

   g. If the cycle is not completed by a pre-set time the alarm sounds and a red light on the control panel comes on. An alarm usually indicates that the reservoir is empty, the supply line is blocked, broken or leaking badly or that there is a pump, solenoid, vent valve, or electric malfunction.

5. The control panel for the lower frame components contains two timers. One is set to activate the system during the dig cycle and the other is set to activate the system during the propel cycle.

OBJECTIVE 7-2

The shovel operator will demonstrate knowledge of the manual lubrication procedures for the shovel.

KEYPOINTS/PROCEDURES

1. All plain and anti-friction bearings not served by the auto-lube systems must be manually greased at pre-determined intervals. The bearings are usually furnished with button or nipple grease fittings for manual lubrication. Lubrication is vital to prolong the life of the components. The shovel operator must supervise or perform manual lubrication as often as required.

2. The type and amount of lubricant, frequency of lubrication and points to be lubricated vary from company to company. Common manual lubrication points for the shovel are:

   - Centre gudgeon nut.
   - Hoist drum.
   - Guide rollers.
   - Trip motor.
   - Crowd shaft.
   - Bucket door shubbers.
   - Banjo lever.
   - Tumbler drive shafts.
   - Magnetorques (inner and outer fittings).
   - Houser rollers (usually lubricated by remote hoses from the lower auto-lube system).

   It is important that each lubrication point receive only the required amount of lubricant. Over greasing can damage the seals in the bearings.

3. Automatic grease capsules can be used for some or all of the manual lubrication points on the shovel. They eliminate the need for manual lubrication but must be checked regularly.

OBJECTIVE 7-3

The shovel operator will demonstrate the proper procedures for having the shovel serviced by a service truck and explain all of the precautions to take.

KEYPOINTS/PROCEDURES

1. Follow these procedures to have the shovel serviced:
   a. Position the shovel in a clear area with the upper frame swung to allow easy access to the house.
   b. Set the dipper on the ground and apply all brakes.
   c. Shut off the shovel to prevent the accidental operation of a control.
   d. The shovel operator must get out of the cab and direct the service truck driver to back up to the shovel.
   e. The shovel operator should supervise or assist in the servicing of the shovel.
   f. After the servicing is completed the shovel operator must check to ensure that the service truck has left the immediate working area before restarting the shovel.
2. While the shovel is being serviced, the operator must be alert to other pieces of equipment or personnel that enter the working area.

OBJECTIVE 7-4

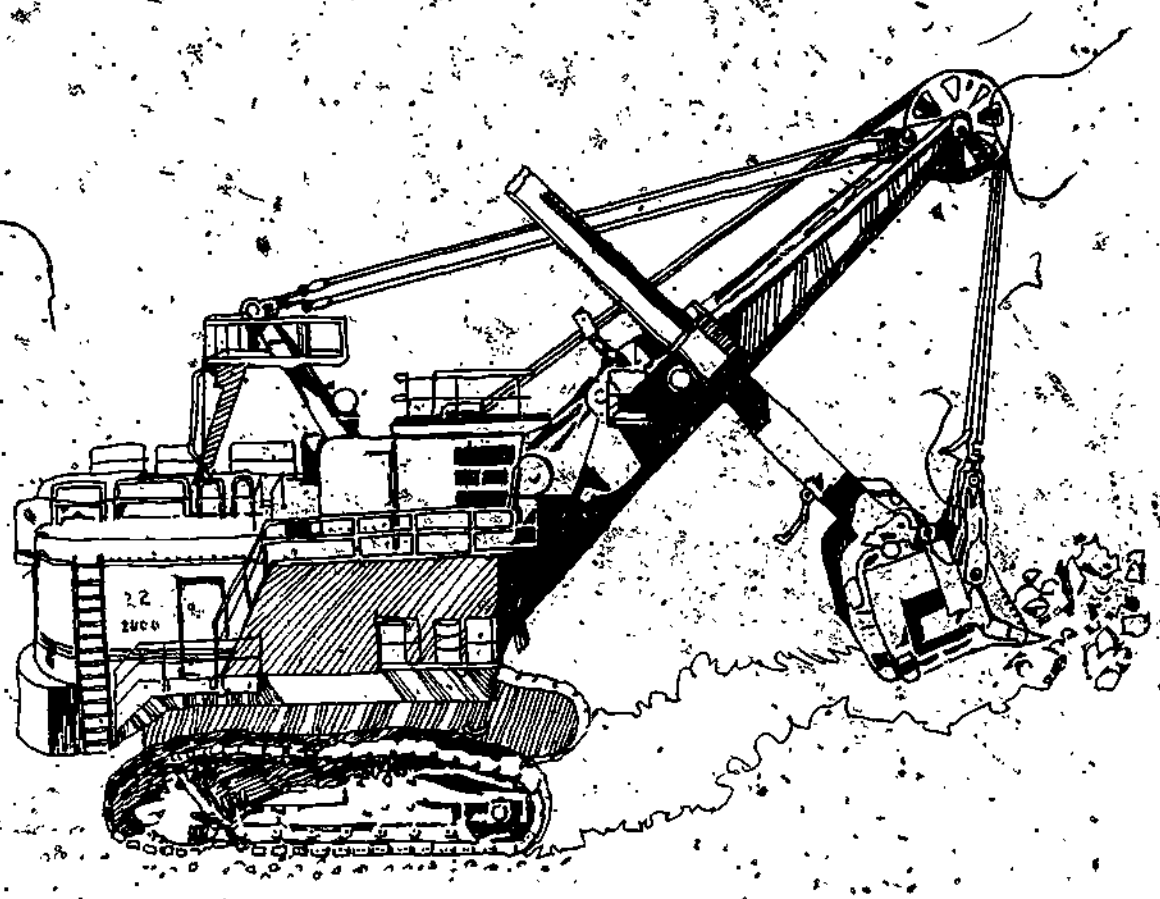
The shovel operator will demonstrate the practices of good housekeeping on the shovel.

KEYPOINTS/PROCEDURES

1. The shovel operator must supervise or perform the housekeeping practices necessary to maintain a clean shovel. Good housekeeping is essential to a safe operation. Follow these good housekeeping practices:
   - Continually cleanup and dipose of all oily rags, paper, etc.
   - Cleanup all grease and oil spills as soon as possible. Eliminate all possible hazards that can cause slips and falls.
   - Keep all stairs, ladders, railings and catwalks clean of grease, oil and mud build-up.
   - Keep all stairs, ladders, catwalks and walkways clear of tools, materials or other obstructions.
   - Keep the cab and house floors clean of grease and dirt build-up.
   - Keep the cab windows and mirrors clean.

SPECIAL ASSIGNMENTS

module 8



ERIC

OBJECTIVE 8-1

The shovel operator will demonstrate the proper digging techniques for high faces.

KEYPOINTS/PROCEDURES

1. High faces are those whose height exceeds the maximum cutting height of the dipper (approximately 46 feet). Follow these procedures for digging high faces:
   a. Select the best approach (Objective 6-4). A frontal approach should be used if the face height exceeds 60 feet. This allows the shovel to retreat if necessary.
   b. Position the shovel as level as possible and correctly for digging (Objective 6-1).
   c. Dig in a planned sequence, beginning as close as possible behind the spotted haul truck and progressively working away from the truck with each successive pass. This allows the material a space in which to fall when the face sloughs. When a slough occurs, restart the digging sequence at the point of the slough that is closest to the spotted truck.
   d. The dipper should enter the toe of the face just under or slightly behind the boom point (Objective 6-1).
   e. If the face does not slough naturally, move the shovel close to the face and scale the top half of the face. When a full cut has been made, move back and load out the material at the toe.
   f. If the face height exceeds 60 feet, a frontal approach should be used and the face should be worked from left to right, keeping the operator's cab on the outside. Haul trucks should be spotted and loaded on the right (cab) side only.
   g. Do not spot haul trucks in an area that a slough can occur.
   h. Do not leave overhangs that can endanger personnel or equipment. If the top of the face does not slough and cannot be scaled down, do not remove the material at the toe.

OBJECTIVE 8-2

The shovel operator will demonstrate the proper techniques for digging hard toes.

KEYPOINTS/PROCEDURES

1. A hard toe is an unblasted section of material, at the bottom of a digging face, that is above the desired bench grade. Hard toes are usually caused by miss-holes, drill holes not deep enough, improper spacing of drill holes, etc. Follow these procedures for digging hard toes:

   a. Remove the material on top of the toe, using normal digging methods, until approximately seven to eight feet of the toe is uncovered.

   b. Position the shovel so that the toe is directly under the boom point.

   c. Assuming a right hand cab, gently set the dipper at the extreme left side of the toe with the dipper teeth at the desired grade. Do not hit the toe with the dipper.

   d. Closely controlling the crowd thrust and hoist power, use the dipper teeth to shave one to two feet off of the toe for the full distance the toe has been uncovered. Attempting to dig a toe using too much speed or power results in the dipper bouncing off of the toe instead of digging it.

   e. Reset the dipper approximately one to two feet to the right of the original position and use the crowd thrust and hoist power to shave another portion off.

   f. Repeat until a full cut of the toe has been made.

   g. Advance the shovel, uncover another section of the toe and repeat the procedure.

   h. If the toe cannot be dug by shaving small portions off, uncover as much of the toe as possible and arrange for a ripper dozer to cut it down. Do not attempt to dig a toe that is solid.

Caution:

When digging toes, extreme caution must be used to avoid machine damage. Hoist and crowd motions must be closely controlled to avoid stalling the dipper or jacking the boom.

OBJECTIVE 8-3

The shovel operator will demonstrate the proper techniques for loading large material.

KEYPOINTS/PROCEDURES

1. Follow these procedures for loading large material:
   a. Position the shovel as level as possible and correctly for digging (Objective 6-1).
   b. Spot the truck correctly (Objective 6-2).
   c. Place one or two dipperfuls of fine material in the truck box to cushion the load.
   d. If the material fits through the dipper, load it into the dipper and place it gently on the material in the truck box. Maintain close control over the hoist, crowd and swing motions while loading.
2. If the material is too large to fit through the dipper, follow these procedures:
   a. Place one or two dipperfulls of fine material in the truck box.
   b. Pick the chunk up and balance it on the dipper's teeth, against the dipper bail.
   c. Have the haul truck pull forward and prepare to back squarely into the dipper. The truck operator must stay in the cab and hold on tight to the steering wheel.
   d. Swing the dipper until it is spotted in a clear area for the truck to back in square (approximately 90° to 120° from the center of the face).
   e. Have the truck backup until the rear of the truck box is almost under the boom point.
   f. Lower the dipper slowly until the chunk contacts the rear lip of the truck box. Allow the truck box to take some of the chunk's weight.
   g. Slowly push the chunk onto the material in the truck box (it may be necessary to flip the chunk onto the material instead of pushing it).
   h. Have the truck respot in the original position and balance the load with fine material.
   i. Maintain close control over the hoist, crowd and swing motions while loading.
   j. Do not try to load material that is too large. If the material is too large, arrange for a dozer to push it out of the loading area.
3. Some companies require direct supervision for the loading of large material.

OBJECTIVE 8-4

The shovel operator will demonstrate the proper techniques for digging ramps.

KEYPOINTS/PROCEDURES

1. Follow these procedures for digging ramps:
   a. Arrange for a dozer to prepare the site and establish the desired downgrade.
   b. Use a frontal approach for digging the ramp. Although a restricted working area necessitates loading one side half of the time, a frontal approach is necessary for effective steering and propelling on the downgrade.
   c. Position the shovel so that the major portion of the digging is performed slightly behind or just under the boom point. When digging behind the boom point, caution must be used to avoid striking the boom and tracks with the heel of the dipper.
   d. Dig in a planned sequence beginning as close as possible behind the spotted haul truck and progressively working away from the truck with each successive pass (Objective 6-3).
   e. The dipper should enter the toe of the face at the tangent point between the face and the ramp floor and, using crowd thrust, should be forced slightly downward.
   f. The full cutting surface of the dipper should be used to cut the face.
   g. The hoist/crowd motions must be closely controlled to allow the dipper to travel downwards, at the desired downgrade, while entering the face.
   h. While digging on downgrades, the dipper should be limited to 75 to 80% of its capacity. This reduces the strain on the swing motors and related components. Swing motions must be closely controlled at all times.
   i. Truck loads should be limited to 75 to 80% of their capacity. This reduces the strain on the wheel motors caused by starting on a downgrade.
   j. Plan the digging and the shovel positions in advance to allow the face to be worked down evenly.
   k. If possible, arrange for a dozer to aid in maintaining the desired downgrade.

OBJECTIVE 8-5

The shovel operator will demonstrate the proper techniques for moving shovels long distances.

KEYPOINTS/PROCEDURES

1. The shovel operator must supervise or assist in the supervision of major shovel moves. This involves planning the move, preparing for the move and directing the shovel helpers. Follow these procedures for moving shovels long distances:

   a. Plan the move. All shovel moves require advance planning to ensure safe, efficient moves.

   b. Inspect the area over which the shovel is to travel and select the shortest, most stable route. If necessary prepare the route. Check for overhead power lines along the route.

   c. Select hard, level or raised ground for steering. Do not steer the shovel in soft material or hollows.

   d. Discuss the moving plan with all concerned (shovel helpers, dozer operators, arch truck drivers, etc.).

   e. Inspect the shovel's lower greasing system. Do not move the shovel if the system is inoperative. Severe damage to the propel machinery can result from lack of proper lubrication. Check to ensure that the reservoir has sufficient grease.

   f. Prepare the trailing cable or the arch in advance. Arrange for extra cable, cable boats, rubber tire dozers, etc., if necessary. Plan any necessary power cuts to add or drop cables.

   g. Arrange for sufficient personnel to direct the shovel or arch truck and handle the trailing cable.

   h. Signal persons on or near the shovel that is to be moved.

   i. Empty the dipper and clean the dipper teeth prior to moving. The dipper should be carried with the dipper sticks horizontal during a long move. Never swing the dipper, loaded or empty, over personnel or equipment.

   j. Keep steering on downgrades to a minimum. If the shovel must travel up or down ramps during the move, align the shovel as much as possible before entering the grade.

   k. Propel and steer in forward propel. Keep reverse propelling and steering to a minimum.

OBJECTIVE 8-6

The shovel operator will demonstrate the proper techniques for digging overburden.

KEYPOINTS/PROCEDURES

1. Follow these procedures for digging overburden:

   a. Use a frontal approach (Objective 6-4). This allows the shovel to retreat if the ground underneath becomes soft.

   b. Position the shovel as level as possible and correctly for digging (Objective 6-1).

   c. Dig in a planned sequence, beginning as close as possible behind the spotted haul truck and progressively working away from the truck with each successive pass.

   d. The dipper should enter the toe of the face just under or slightly behind the boom point. Avoid overcrowding when entering the face. Digging downward, in overburden, creates soft spots in the shovel loading area.

   e. When digging unblasted overburden, use approximately one-third to two-thirds of the dipper width to cut the face, depending on the digging conditions. This allows the dipper to shave the material off of the face and aids the flow of material into the dipper. Unblasted overburden also has a tendency to hang-up instead of sloughing. If the face does not slough naturally, move the shovel close to the face and scale the top half of the face. When a full cut has been made, move back and load out the material at the toe.

   f. Do not spot haul trucks in an area that a slough may occur.

   g. Maintain close hoist/crowd motion control. Overburden often breaks off in large chunks or has large boulders hidden in it.

   h. Maintain a close watch on the front of the shovel tracks. If they begin to sink, backup and fill them in with the shovel dipper or arrange for a dozer to dress them up. If they continue to sink, reposition the shovel on firmer ground. When repositioning the shovel, back straight out to a clear area with solid footing before steering. Do not attempt to steer on soft ground.

   i. When loading wet overburden, limit the dipper and haul truck loads to 75 to 80% of their capacity. Wet overburden is significantly heavier than other material and the loads should be adjusted accordingly.

   j. When necessary, arrange for a dozer to aid in maintaining a level pit floor in the shovel's loading area.

BC
Province of British Columbia

OPEN PIT MININ
SHOVE
SKILL P

BASIC SAFETY AND OPERATING RULES	EXPLAIN THE IMPORTANCE OF SAFETY AND OPERATING RULES	EXPLAIN THE IMPORTANCE OF REPORTING ACCIDENTS AND INJURIES	EXPLAIN THE IMPORTANCE OF STATING ALERT TO CHANGING CONDITIONS	EXPLAIN THE COMPANY TRAFFIC CONTROL SCHEME	EXPLAIN HOW TO PREVENT TIRE DAMAGE
	EXPLAIN THE COMPANY'S POWER CABLE HANDLING POLICY	EXPLAIN THE COMPANY'S LOCK OUT PROCEDURES			
COMMUNICATIONS	SEND AND RECEIVE SIGNALS	FILL OUT REPORT FORMS	OPERATE THE MOBILE RADIO	READ SURVEY STAKES	
INDICATORS AND CONTROLS	LOCATE AND IDENTIFY THE GAUGES CONTROLS INDICATORS AND SWITCHES	DESCRIBE THE FUNCTION OF EACH GAUGE AND INDICATOR	DESCRIBE THE FUNCTION OF EACH CONTROL AND SWITCH		
PRE-START AND OPERATIONAL CHECKS	LOCATE AND IDENTIFY THE BASIC UNITS AND RELATED COMPONENTS	LOCATE IN SEQUENCE THE PRE-START AND OPERATIONAL CHECK POINTS	PERFORM THE PRE-START CHECKS	PERFORM SHOVEL START UP AND SHUT DOWN PROCEDURES	PERFORM OPERATIONAL CHECKS
BASIC OPERATION	PERFORM HOIST MOTION CONTROL	PERFORM CO-ORDINATED HOIST CROWD MOTION CONTROL	PERFORM SWING MOTION CONTROL	PERFORM CO-ORDINATED HOIST CROWD SWING MOTION CONTROL	PERFORM PROPEL MOTION CONTROL
SHOVEL PRODUCTION	DIG LOOSE OR BLASTED MATERIAL	SPOT HAUL TRUCKS	LOAD HAUL TRUCKS	POSITION THE SHOVEL	MAINTAIN A CLEAN LEVEL FLOOR
LUBRICATION AND SERVICE	DESCRIBE THE AUTOMATIC LUBRICATION SYSTEMS	DESCRIBE MANUAL LUBRICATION	SERVICE THE SHOVEL	PRACTISE GOOD HOUSEKEEPING	
SPECIAL ASSIGNMENTS	DIG HIGH FACES	DIG HARD TOES	LOAD LARGE MATERIAL	DIG RAMPS	PERFORM MAJOR SHOVEL MOVES

OB TRAINING SERIES
OPERATOR
FILE CHART

Developed by:
Research and Curriculum Development Branc
Post-Secondary Department
Ministry of Education
1983

EXPLAIN NORMAL AND MERGENCY BRAKING TECHNIQUES	EXPLAIN THE IMPORTANCE OF GOOD HOUSEKEEPING	EXPLAIN THE COMPANY GUARDING AND BLASTING PROCEDURES	DESCRIBE THE BASIC LAYOUT OF THE PIT AREA	EXPLAIN THE USE OF FIRE SUPPRESSION SYSTEMS AND FIRE EXTINGUISHERS	DESCRIBE THE MISS-HOLE AND MISS-HOLE REPORTING PROCEDURES	EXPLAIN THE COMPANY SHOVEL BOARDING PROCEDURES
PERFORM EERING MOTION CONTROL						
DIG ARD MATERIAL	DIG LOW FACES	MOVE THE SHOVEL	MAINTAIN THE SHOVEL WORKING AREA			
DIG ERS EDEN						

THE DACUM APPROACH

DACUM is a systematic model of program development used in designing career, technical and vocational training programs. The first step in the process is to establish the skills expected of a graduate entering employment. These skills are generally specified by a representative employer group in a workshop conducted by program development specialists. The product of this activity is a skill profile chart. This chart is then circulated both to the participants and to a number of other employers for review prior to further development.

The next step is to specify learner-centred performance objectives. These include not only the skills a learner must demonstrate but also the conditions under which the skill is to be performed and the criteria used to determine the acceptable standard of performance.

Once the performance objectives have been set there are three important steps to complete the development process. These are generally undertaken by an instructor or group of instructors in the following order:

1) Appropriate evaluation instruments are chosen or created to assess student capability in relation to the specific objectives of the program.

2) A variety of suitable instructional techniques and learning experiences are chosen to facilitate learning of the skills and knowledge required to meet the objectives.

3) Instructional resources (texts, films, models and other learning aids) are selected or created.

READING THE SKILL PROFILE CHART

A skill profile chart (often referred to as a DACUM Chart), is a graphic representation of the essential skills expected of a student graduating from a specific career, vocational or technical program.

Broad areas of employee responsibility are shown in the boxes on the left of the chart. These are called "general areas of competence". The tasks or skills related to each are sequenced along the horizontal track to the right of the general area of competence.