

DOCUMENT RESUME

ED 246 292

CE 039 354

TITLE Track Dozer Operator. Open Pit Mining Job Training Series.

INSTITUTION British Columbia Dept. of Education, Victoria.

REPORT NO ISBN-0-7718-6337-4

PUB DATE 82

NOTE 111p.; Joint project of the Ministry of Education and the member companies of the Mining Association of British Columbia. For related documents, see CE 039 352-359.

AVAILABLE FROM Publication Services Branch, Ministry of Education, 878 Viewfield Road, Victoria, BC V9A 4V1 (\$6.00).

PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.

DESCRIPTORS Adult Education; Behavioral Objectives; Coal; Communication (Thought Transfer); Communication Skills; Competency Based Education; Course Content; Course Descriptions; Curriculum Guides; Equipment Maintenance; *Equipment Utilization; Foreign Countries; Interpersonal Communication; Job Skills; Learning Modules; *Machinists; Metals; *Mining; On the Job Training; Organizational Communication; Postsecondary Education; Safety; *Trade and Industrial Education

IDENTIFIERS British Columbia; *Heavy Equipment Operators

ABSTRACT

This training outline for track dozer 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 nine modules. Each module is based on 3 to 17 objectives. For each objective, key points and procedures are outlined. Module topics are basic safety and operating rules, communications, gauges and controls, pre-start and operational checks, basic dozer operation, dozer production operation, service and refuel, exploration work, and special assignments. A skill profile chart is attached. (YLB)

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TRACK DOZER OPERATOR

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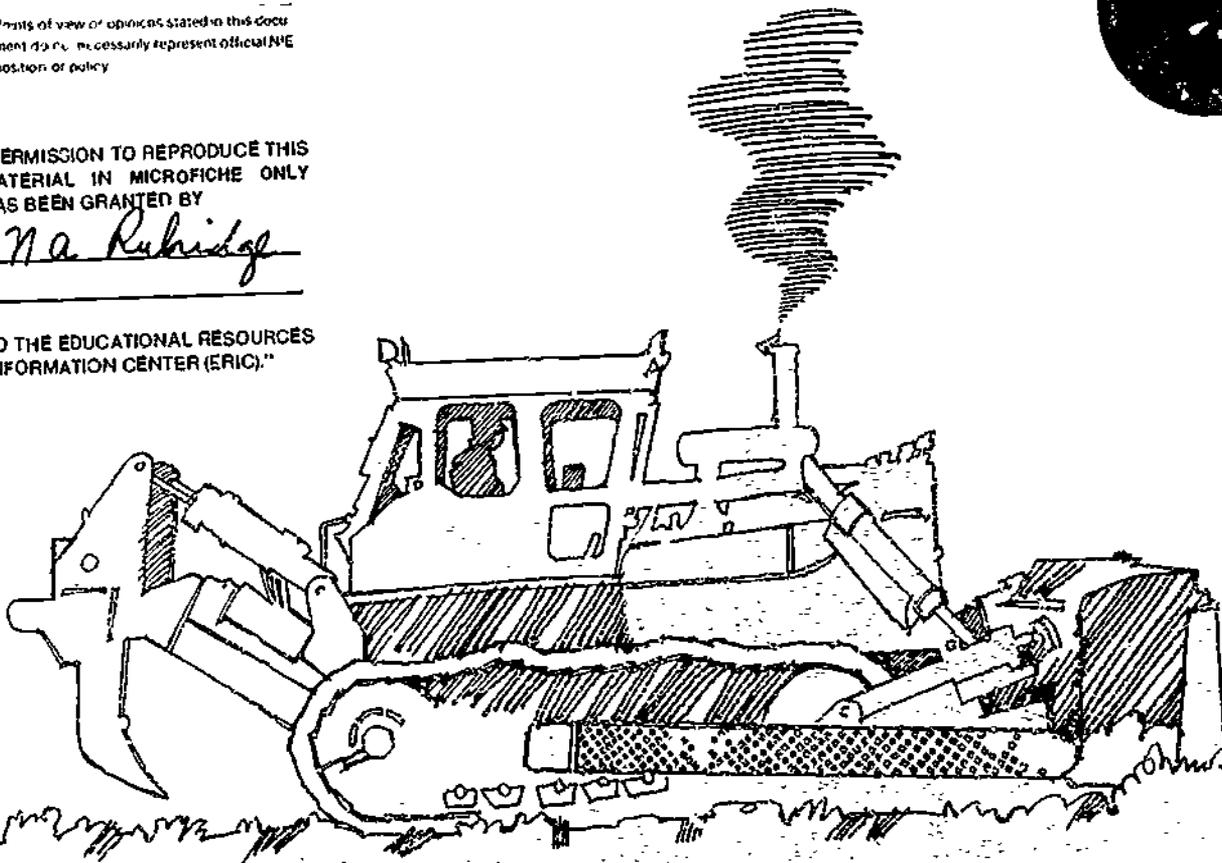
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- Haulage Truck Operator
- Rubber Tire Dozer Operator
- Track Dozer Operator
- Front End Loader Operator
- Grader Operator
- Rotary Drill Operator
- Shovel Operator
- Heavy Duty Tireman

**OPEN PIT MINING
JOB TRAINING SERIES
TRACK DOZER OPERATOR**

**A joint project
of the
Ministry of Education
and
member companies of the
Mining Association of British Columbia**



**Province of
British Columbia
Ministry of Education
POST-SECONDARY DEPARTMENT
1982**

Canadian Cataloguing in Publication Data

Main entry under title:

Track dozer operator

(Open pit mining job training series,
ISSN 0715-0709)

"A joint project of the Ministry of Education and
member companies of the Mining Association of
British Columbia".

ISBN 0-7718-8337-4

1. Tractor driving - Study and teaching -
British Columbia. 2. Bulldozers. I. British Columbia.
Ministry of Education. Post-secondary Dept. II. Mining
Association of British Columbia. III. Series.

TL233.3.T72 629.28'45'0715 C82-092329-X

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Post-Secondary Department
Ministry of Education
St. Ann's Academy
835 Humboldt Street
Victoria, B.C.
V8V 2M4
Telephone: (604) 387-5541

Copies of this publication can be ordered from:

Publication Services Branch
Ministry of Education
878 Viewfield Road
Victoria, B.C.
V9A 4V1
Telephone: (604) 387-5331 Cost \$5.00 plus 10% shipping

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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 responsibilities in the training department at B.C. Coal. Bill wrote the *Haulage Truck Operator*, *Kubber 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 *Track Dozer Operator* outline:

Doug Greff, B.C. Coal Ltd.
Jim Bertrand, Brenda Mines Limited
A.B. Wiebe, Crowsnest Resources Ltd.
Gerry Charette, Crowsnest Resources Ltd.
Mike Taillon, Fording Coal Limited
Jim Cahoon, Noranda Mines 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 track dozer is a Caterpillar D9H. 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:

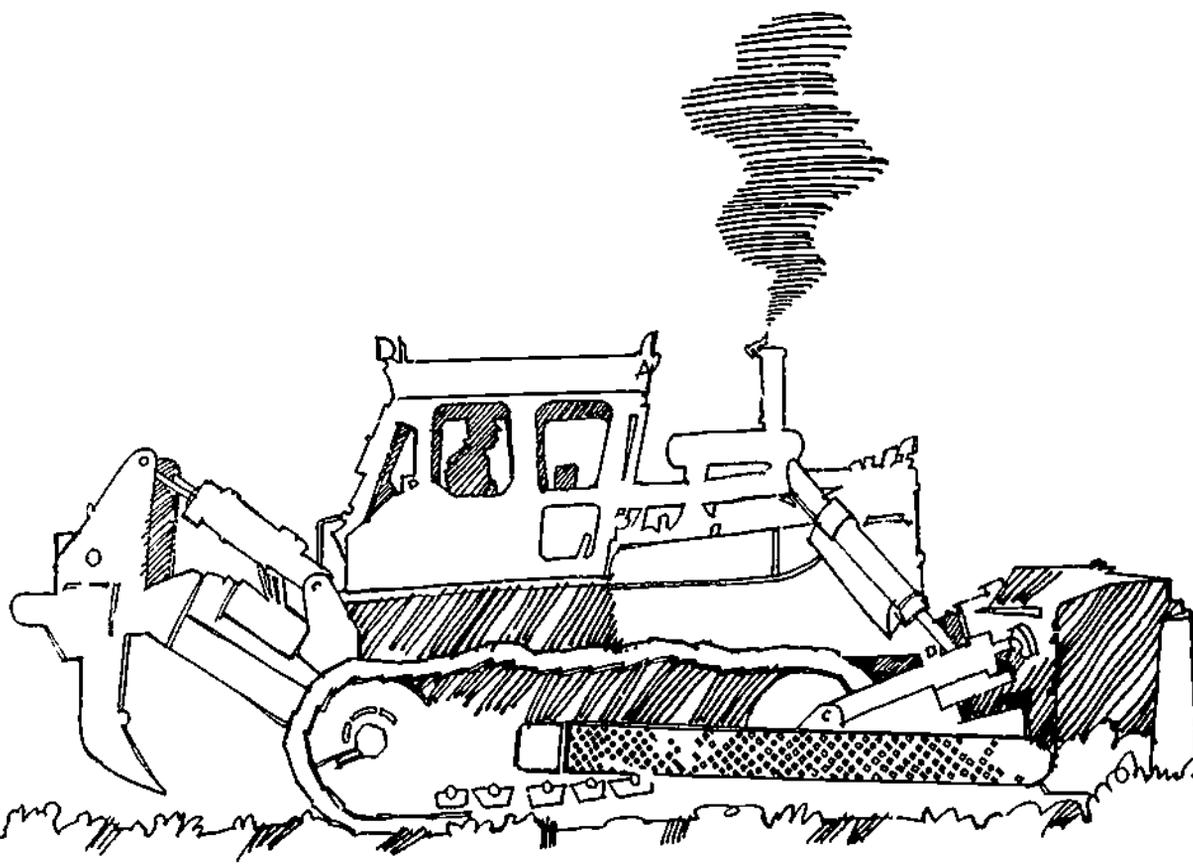
Research & Curriculum Development Branch,
Ministry of Education,
7451 Elr. bridge Way,
Richmond, B.C.
V6X 1B8
Telephone: (604) 278-3433

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



OBJECTIVE 1-1

The dozer operator will explain how safety and operating rules set by the company and the *Mines Regulation Act* protect the operator and fellow workers on the mine site.

KEYPOINTS/PROCEDURES

1. Presented here is a basic introduction of safety and equipment operating rules. Individual companies should incorporate their own safety rules into this material.

2. **Personal wear**

Safety rules concerning personal wear are set for the protection of the dozer operator and include proper use of:

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

3. **Personal conduct**

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

- Horseplay
- Reading on the job
- Alcohol and drugs

4. **Pre-start check**

Safety rules pertaining to pre-start checks are set to ensure personal protection while conducting the check. The rules also ensure that the dozer is in a safe operating condition before it is put into production. Special caution is required when:

- Working around moving components on the dozer such as fans and belts.
- Removing radiator caps.
- Climbing on or off the dozer.

It is essential for operators to report immediately any operational problems with brakes or steering. Operators should also ensure that the dozer is always equipped with a fire extinguisher.

Rules 263 (d) and 263 (e) of the *Mines Regulation Act* and rules 195 (d) and 195 (e) of the *Coal Mines Regulation Act* state:

(d) The driver or operator of any vehicle or mobile equipment shall examine and test his equipment at the beginning of each shift before putting it into use; and if any unsafe condition is noted, such equipment shall not be used and the immediate supervisor shall be notified.

(e) For each vehicle or piece of mobile equipment, a logbook or other suitable record shall be maintained, in which shall be entered a record of all unsafe conditions and the repairs made, and all notations shall be signed by the person making the en-

try, and the logbook or records shall be available for inspection at all times.

It is the dozer operator's responsibility to comply with these rules.

5. Operating

Operating rules ensure the safety of the dozer operator and other personnel on the mine site.

Only those authorized by the company are allowed to operate dozers.

There is a blind area immediately surrounding the dozer, especially when the ripper assembly is raised. Before moving the dozer, the operator must check this area on foot in the yard area and visually in the pit.

Rule 264 (a) (iii) of the *Mines Regulation Act* and rule 196 (a) (iii) of the *Coal Mines Regulation Act* both state:

No person shall operate or put in motion any vehicle or mobile equipment unless he has just previously inspected on foot the area over which the equipment is to be moved.

The dozer operator must immediately follow all warning signals given by others on the mine site including horns, lights and hand signals. These signals are covered in OBJECTIVE 2-1.

6. Traffic control scheme

It is the dozer operator's responsibility to obey the traffic control scheme set out by the company (OBJECTIVE 1-3).

Rules 264 (b) of the *Mines Regulation Act* and 195 (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. Dumping

Dumping rules ensure a safe and efficient operation at the dumping area. The dump supervisor is the key person in the area having direct control of dumping activities. The dozer operator should be alert for the following conditions.

- Settling dumps having either cracks or slippage.
- Improper incline to the edge of the dump.
- Improper consistency of the berm (snow and ice; sand or fine grade material).
- Additional equipment around the dump.
- Excessive traffic in the area.

While working in a dump there are times that the dozer operator may be called upon to act as a dump supervisor using all proper dump supervisor procedures.

Rule 272 of the *Mine Regulation Act* and rule 203 of the *Coal Mines Regulation Act* both state:

- (a) No material shall be dumped from any vehicle over a bank more than ten feet high unless:
 - (i) there is available an effective ridge of material, or an anchored dump block, to act as a backstop; and
 - (ii) there is a dump supervisor who shall be responsible for signalling and truck-dumping procedures and for checking and reporting the stability of the dump, but the Inspector may exempt an operation from the requirement of this paragraph where:
 - (A) the haulage truck capacity is less than forty tons; or
 - (B) the tonnage being dumped is less than five hundred tons in an eight-hour shift; or
 - (C) the nature of the material being dumped does not require a dump supervisor; but in no case shall dumping be done from an unsafe bank.
- (b) Where a dump supervisor is employed at a dump, no person shall move or dump a truck at the dumpsite unless and until he receives a directional order from the dump supervisor.

8. Servicing

Servicing rules ensure the safety of all personnel in the servicing area. The dozer operator must take the following precautions:

- Do no smoke or strike an open light while fuelling.
- Always clear the area of people before moving the dozer in or out of the servicing area.
- Add oil or grease only when the dozer engine is shut off.
- Remove the radiator cap only when the engine has cooled down and use extreme caution when removing it.
- Lower the blade and ripper to the ground slowly; do not drop them.
- Be out of the cab when the dozer is being serviced.

Servicing procedures are covered in Module 7, "Service and Refuel."

9. Parking

Safe parking procedures are established for the safety of personnel working around the dozer. The dozer operator must obey all parking procedures when leaving the dozer:

- a. Park on level ground.
- b. Lower the ripper and blade assemblies to the ground.
- c. Set the brakes.
- d. Place the transmission in neutral.
- e. Engage the transmission lock.
- f. Allow a cooling period of at least 5 minutes for the engine.
- g. Shut off the engine.
- h. Turn the disconnect switch off.

OBJECTIVE 1-2

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

KEYPOINTS/PROCEDURES

1. Weather

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

2. Roads

Road conditions change with the weather ranging from slippery to dusty. The dozer operator must stay alert to icy, slippery conditions because a dozer has a tendency to slide very easily when it's icy.

3. Other equipment and ground personnel

The dozer operator must always be aware of other equipment working or travelling in the vicinity. The operator must also watch for ground personnel in the area.

4. Traffic control scheme

The traffic control scheme at the working face while trucks are being loaded is constantly changing and the dozer operator must be aware of the changes. On the other hand the traffic control scheme at the dump area and on the haul roads usually changes very little. However, the dozer operator should be aware that changes can occur at the dump or on haul roads.

5. Working conditions

At the work face working conditions are constantly changing. The operator must watch for moving equipment and the sluffing or rolling down of material from the face. At the dump the dozer operator must be alert for moving equipment and for the possibility of the dump moving or cracking.

6. Dozer performance

An alert dozer operator can determine a change in the dozer's performance by knowing how the dozer sounds and reacts under normal working conditions. For example, the operator should be able to tell if his dozer is losing power.

7. Light

The change from daylight to night and vice versa creates an operating condition that demands added attention and alertness.

OBJECTIVE 1-3

The dozer operator will describe the mine site's traffic control scheme for the haulage roads and the loading and dumping areas.

KEYPOINTS/PROCEDURES

1. At all times the operator must follow the company's established traffic control scheme unless directed otherwise by the supervisor.

2. Right of ways

Although the dozer is a slow moving piece of equipment compared to other equipment in the pit area, the dozer operator must adhere to the traffic control scheme the same as any other vehicle and pull over to give the right of way to faster travelling equipment.

One example of a right of way priority system is:

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

Caution:

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

3. Keep right

At all times the dozer operator must keep to the right unless otherwise directed by the supervisor or by proper signs.

4. Traffic signals

Obey all traffic signals and signs including:

- Lights at the breaker station or crusher (if the red light appears at the crusher hopper, do not push material into the hopper.)
- Stop signs or yield signs.

5. Merging traffic

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

6. Changing road systems

When road systems change, operators must be forewarned and also advised as to what traffic will have the right of way. Dozer operators should always give way to faster moving equipment.

7. Parking

Park dozers on the most level area possible. Never park or leave a dozer within 50 feet of either haulage trucks or the working face. Lower the blade and ripper. Set the brakes and put the transmission into neutral and lock it out. After a short cooling down period of 5 minutes shut the engine off. Never park within 50 feet (or the distance the company has established) of the working face.

OBJECTIVE 1-4

The dozer operator will explain the importance of preventing tire damage and also what to do to prevent tire damage.

KEYPOINTS/PROCEDURES

1. Road hazards

The dozer operator must constantly be aware of the road condition with respect to possible spill rock from trucks, metal objects and possible pot holes. The operator can push any foreign material off the road while travelling, but may have to repair the pot holes by digging and replacing the material.

2. Work face area

In the working face area the dozer operator should be alert to possible spill rock from haulage trucks and shovel buckets. This loose material must be pushed back into the face for the shovel to load out.

3. Dumps

Loose material left on dumps can be pushed over the edge or to the side so that haulage trucks do not travel over it.

OBJECTIVE 1-5

The dozer operator will explain both normal and emergency braking techniques for dozers.

KEYPOINTS/PROCEDURES

1. Normal braking

For normal braking of the dozer, reduce the engine speed to a low idle but do not shut off the engine. As the dozer is slowing down, apply both brake pedals at the same time. This will bring the dozer to a complete stop. Once the dozer is stopped, place the transmission into neutral and engage the transmission lock. Also, lock the brakes on, then lower the blade and ripper. After a cooling down period shut down the engine. Turn the disconnect switch off. Remove the key when applicable, e.g., with exploration work.

Note:

During extreme cold weather do not lock the brakes on. The brakes could be frozen on and cause problems. Besides, with both the blade and the ripper down on the ground, it is hard for a dozer to move on its own.

2. Emergency braking

Emergency braking means to bring the dozer to a complete stop as quickly as possible. In order to accomplish this, first reduce the engine speed to an idle. Then lower all hydraulic equipment to the ground as quickly as possible. This action alone may stop the dozer. While performing the above procedures, the dozer operator should be applying both brake pedals as hard as possible. Shift the transmission to the lowest gear at the same time. All the above steps should be done as smoothly and simultaneously as possible. Once the dozer is stopped, kill the engine, turn the disconnect switch off, and remove the key.

OBJECTIVE 1-6

The dozer operator will explain the importance of good housekeeping practices.

KEYPOINTS/PROCEDURES

1. The importance of good housekeeping is to maintain a safe and pleasant environment to work in. Employees have the responsibility to keep their own work area in good condition; good housekeeping is an essential part of each employee's job. A disorderly and dirty work area can cause accidents, injuries and low morale.
2. Good housekeeping on the dozer is essential for safety and includes the following:
 - Keep all windows and mirrors clean for good visibility.
 - Keep the dash clean, primarily the gauges, so that you can accurately read them.
 - Clean the cab of all paper, rags, dirt and mud.

OBJECTIVE 1-7

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

KEYPOINTS/PROCEDURES

1. The blasting procedure is enacted on the day of the blast. Notification is given to employees to make them aware of the blast. This notification, however, is not the final precaution. Before blasting, the supervisor makes a careful physical check to ensure that no one is in the area. All employees are evacuated to a safe distance. Once the area is evacuated, all access roads are closely guarded to prevent access into the area while the blast occurs.
2. The guards have the authority to stop anyone from entering the blast area. The guards should be visibly identifiable, e.g., by a coloured vest issued to them by supervision. They will remain at the location designated by supervision until relieved by another guard or told otherwise by supervision.
3. Should any irregularities occur, it is the guard's responsibility to immediately notify supervision.
4. Frequently the dozer operator is used as a guard. When this occurs the operator should be on the ground to stop traffic.

OBJECTIVE 1-8

Given a map of the pit area layout, the dozer operator will give the proper names of pits and haul roads and will locate the dump areas by name or number. The dump areas include waste dumps, stockpiles, and breaker station or crusher station locations.

KEYPOINTS/PROCEDURES

1. Each property is different in layout and in names and numbers of dumps, pits, etc.
2. Besides knowing the basic layout of the pit area, some properties may also want operators to know the shovel locations.

OBJECTIVE 1-9

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

KEYPOINTS/PROCEDURES

1. Fire suppression system

The fire suppression system found on some dozers consists of mounted dry chemical tanks that have an appropriate pressure source to distribute the chemical powder. Hoses run from the tanks to nozzles at all critical areas of the dozer. Release is manually performed by the operator from either the operator's cab or somewhere on the ground. The operator pulls a button that releases the pressure sources and if the system is working the dry chemical spreads as desired.

2. Fire extinguishers

Most dozers are only equipped with a hand fire extinguisher. Shut down the engine before using the extinguisher. To use the extinguisher aim the dry chemical flow at the base of the fire and move the extinguisher flow from side to side. This side to side action forces the flames away from the source and also has a cooling effect. The dry chemical cuts off the oxygen at the source of the flame and consequently puts out the fire.

3. Speed is the important factor in combating a dozer fire. First shut down the engine, then suppress the fire quickly to avoid being faced with a wider spread fire that is more difficult to contain.

OBJECTIVE 1-10

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

KEYPOINTS/PROCEDURES

1. A miss-hole is a drill hole that was loaded with explosives but during the blast did not explode, leaving the hole still full of explosives.
2. If a dozer operator notices a miss-hole, the operator should:
 - a. Notify the supervisor immediately.
 - b. Properly mark the miss-hole, and do not operate within 25 feet of it.

OBJECTIVE 1-11

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

KEYPOINTS/PROCEDURES

1. Accidents

All accidents must be reported to your 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 your 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 responsibility of all employees to report any hazardous act or condition to their supervisors immediately.

OBJECTIVE 1-12

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

KEYPOINTS/PROCEDURES

1. A power cable handling policy should be established by each company and should be followed by all personnel handling power cable. This policy should include the following precautions:
 - a. Use 10,000 volt hot gloves or other approved protective devices at all times when handling power cable. Do not step on power cable or allow power cable to come into contact with any part of the body.
 - b. Inspect hot gloves before use and discard them if defective. Hot gloves must be covered with "leathers". Do not use hot gloves if they are wet inside. Do not use hot gloves for any purpose other than handling power cable.
 - d. Treat all power cable attached to sub-stations or switch houses as energized.
 - e. Never place any part of the body, even if protected by hot gloves, on or near cable terminals located inside potheads and junction boxes.

- f. No one other than an authorized person is to energize, de-energize, connect or disconnect power cables.
- g. Treat cable arches the same as power cable when the cable over the arch is connected to a sub-station or switch house.
- h. 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 can make repairs to power cables.
- i. Never run over unprotected power cable with any vehicle or piece of equipment.
- j. Never pull more than 75 feet of power cable in any single pull. Power cables can be damaged by stretching.
- k. When removing junction boxes and potheads, support them adequately and keep them clear of the pit floor. Rough handling of junction boxes can cause damage to the boxes or to the power cable by the flexing of the cables at the boxes.
- l. Disconnected cable retains a residual charge (about 110 volts), so use caution even with disconnected cable.
- m. Padlock the input side (hot side) of a pothead-type switch house so that it cannot be inadvertently removed.

OBJECTIVE 1-13

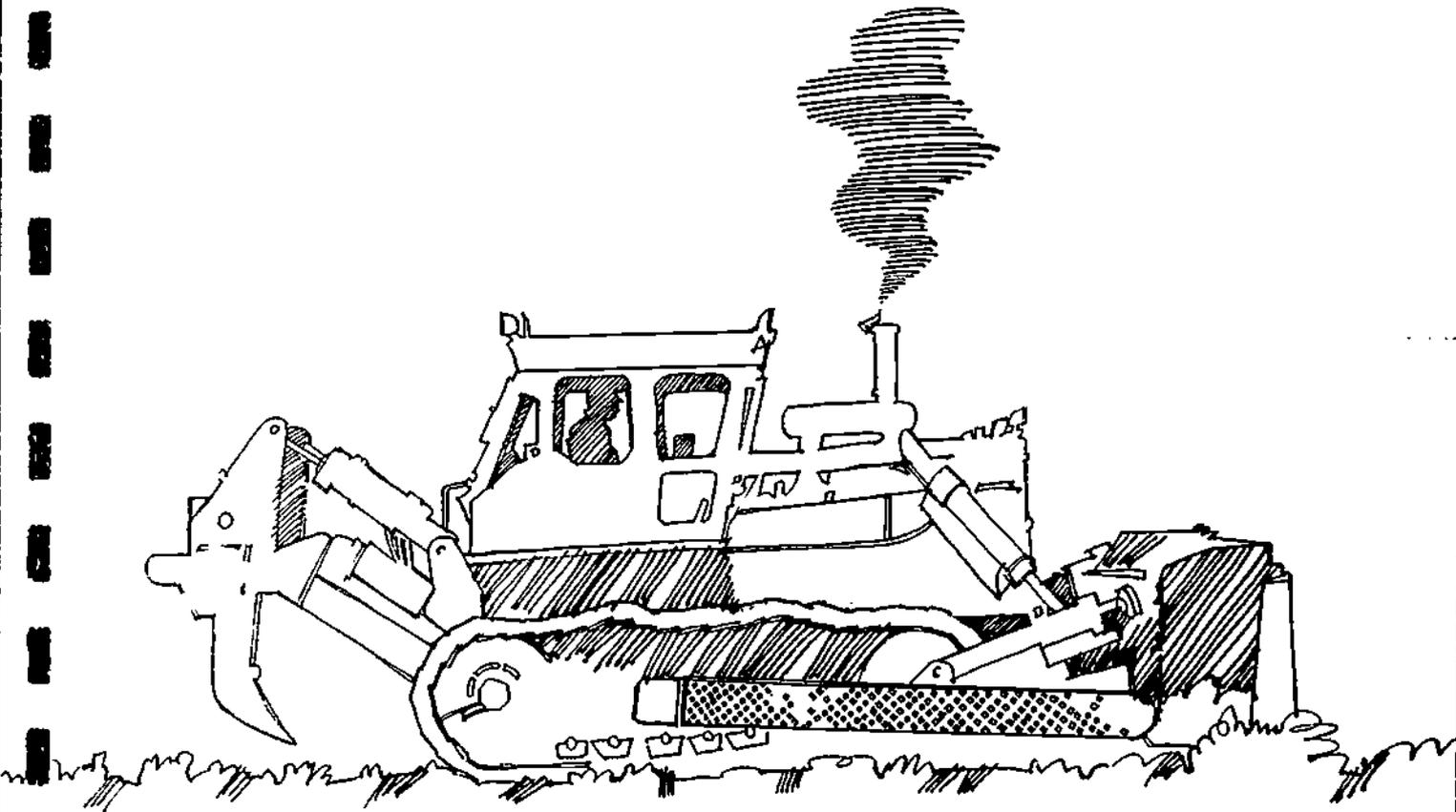
The operator will explain the company's lock-out procedure.

KEYPOINTS/PROCEDURES

1. To ensure the safety of both maintenance and operating personnel, a procedure for locking-out equipment should be established by the company and followed by all personnel.
2. Locking-out equipment means basically that wherever the possibility exists of the equipment starting, energizing, or moving, a possibility that could create a hazardous situation, that piece of equipment should be locked-out and caged by the people working on it. A lock-out procedure is designed to prevent accidents and personal injury. Never remove another worker's padlock or tag without authorization. Check with your supervisor for instructions.
3. The operator is required to know the location of the lock-out station for the equipment, and must always check this station for pad-locks or do-not-operate tags before attempting to start the shovel.

COMMUNICATIONS

module 2



OBJECTIVE 2-1

The dozer operator will:

- a. Describe the traffic light system for dumping at the breaker station, grizzly or crusher.
- b. Demonstrate in full view the hand signals a dump supervisor gives so that the operator can give these signals when required.
- c. Describe the horn signals used by the truck, shovel and loader operators.

KEYPOINTS/PROCEOURES

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

2. **Truck operator's signals**

A dozer operator is required to know the following horn signals given by truck operators:

- Start engine.
- Stop.
- Go ahead.
- Back up.

All haulage trucks should be equipped with automatic back up horns so that the dozer operator is alerted when trucks are backing up.

3. **Shovel operator's or loader operator's signals**

The dozer operator is required to know the following signals given by shovel and loader operators:

- Stop.
- Go ahead
- Back up.

4. **Lights at the crusher or breaker station**

Mines requiring dozers to push material into either a grizzly, bin, or crusher that has a signal light system attached to it should require their operators to know:

- Red — Do not push material into bins, crushers or grizzlies.
- Green — All clear to push material.
- Amber — Wait.

5. **Dozer operator's dump signals**

- Backup — The dozer operator rotates the right arm in a circular motion clockwise. This signal directs the truck to backup towards the safety berm.
- Stop — Once the truck reaches the desired place at the safety berm, the dozer operator signals a stop by moving the right arm up and down.
- Dump — When the truck stops in the designated position the dozer operator signals to dump by holding the right arm straight up in the air.
- Move out — Once the truck has dumped its load over the safety berm, the dozer operator points to the truck that is to move out. The truck must not move until the dump body is completely down and the dozer operator signals the truck to move out.

OBJECTIVE 2-2

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

KEYPOINTS/PROCEDURES

1. Production reports

The production reports are filled out to include the:

- Area code number of the pit in which the dozer operator is working.
- Code number of the material the operator is pushing or the type of work performing.
- Equipment numbers of the dozer the operator is using.

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

2. Timecards

Timecards should include the:

- Area code number of the pit in which the operator is working.
- Code number of the material the operator is pushing or the type of work performing.
- Equipment numbers of the dozer the operator is using.

3. Daily logbooks

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

- General repairs to the dozer.
- Fuel up times so that the oncoming operator knows approximately how much fuel is left.
- Any general information, for example on steering and brakes, that help the oncoming operator.

Rule 263 (e) of the *Mines Regulation Act* and rule 195 (e) of the *Coal Mines Regulation Act* state:

For each vehicle or piece of mobile equipment, a logbook or other suitable record shall be maintained, in which shall be entered a record of all unsafe conditions and the repairs made, and all notations shall be signed by the person making the entry, and the logbook or records shall be available for inspection at all times.

4. Report to the oncoming operator

It is important that the oncoming operator knows the prior shift's history of the dozer. Operators should report unsafe or hazardous equipment first of all to the supervisor and then to the oncoming operator.

OBJECTIVE 2-3

The dozer operator will operate the mobile radio on the mine site and explain the proper procedures for its use.

KEYPOINTS/PROCEDURES

1. Radios on track dozers are uncommon but the dozer operator should know proper radio use in the event of an emergency.
2. **Using a radio**

Proper and effective use of the radio is important:

 - a. Identify the sender by the unit or vehicle number.
 - b. Identify the receiver by the unit or vehicle number.
 - c. Wait until the receiver acknowledges.
 - d. Relay the message in a clear and precise manner.
 - e. State whether the call is an emergency or not.
3. Radios are restricted to necessary operational transmissions. Never use profane language over the radio.
4. **Emergency call**

In the event of an unsafe 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, depending on the mine's procedures.

OBJECTIVE 2-4

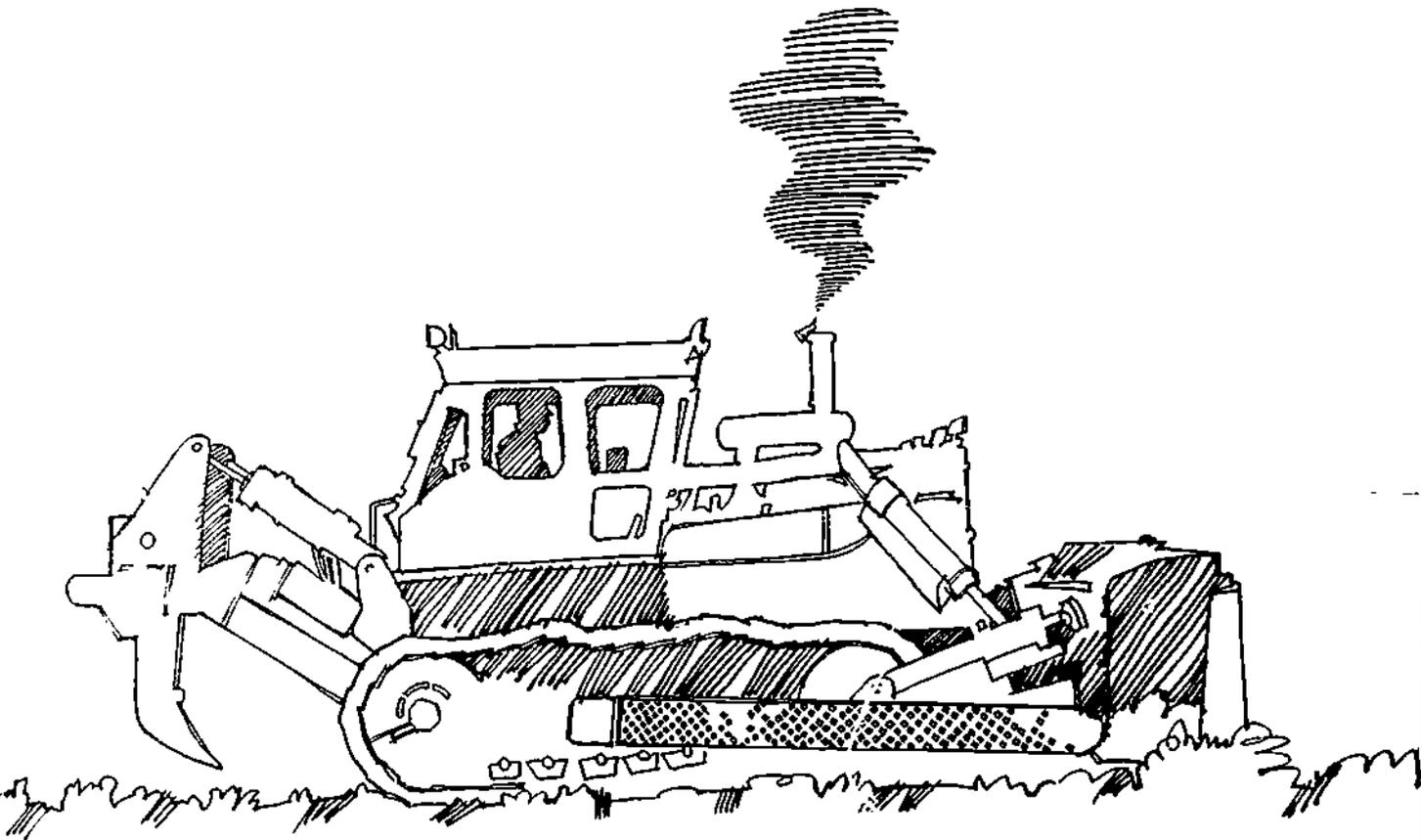
The dozer operator will explain the different survey stakes used at the mine site.

KEYPOINTS/PROCEDURES

1. Each mining property has its own system for survey staking including color coding.
2. **Primary control points**
The primary control point is the basis for all survey work in the area and therefore should be set with the utmost accuracy.
3. **Secondary control hubs**
Secondary control hubs are set from the primary control point and are the basis of all the actual field work.
4. **Batterboards**
Batterboards are used for sighting bench grades.
5. **Drill hole stakes**
Drill hole stakes locate the position of a drill hole for blasting. On the stake is the number of the blast hole and the depth it is to be drilled.
These stakes are retained after drilling for loading information.
6. **Drill limit stakes**
Drill limit stakes mark the drilling boundary in order to avoid any unnecessary drilling.
7. **Digging limit stakes**
Digging limit stakes indicate the limit the digging is to go. Digging beyond these stakes may be a wasted effort.
8. **Blast boundaries**
Blast boundary stakes indicate the limit of clean-up required to start drilling a new blast area and possibly the limit of digging of a previous blast.
9. **Dump monitors**
Dump monitor stakes indicate the amount of settling or movement of a dump. These monitors are extremely important for safety and should be checked regularly.
10. **Road stakes**
Road stakes mark the center and shoulders of the road surface.

GAUGES AND CONTROLS

module 3



OBJECTIVE 3-1

The dozer operator will locate and identify the gauges, controls, and switches in the dozer cab.

KEYPOINTS/PROCEDURES

1. **Gauges in the dozer cab**
 - Engine oil pressure gauge.
 - Engine temperature gauge.
 - Engine coolant pressure gauge.
 - Ammeter gauge.
 - Fuel pressure gauge.
 - Converter oil temperature gauge.
 - Hydraulic oil temperature gauge.
 - Air filter indicator.
 - Hydraulic system oil level indicator.
 - Diesel fuel level indicator.
 - Engine oil level indicator.
 - Transmission oil level indicator.
2. **Controls and switches in the dozer cab**
 - Left steering clutch and brake control.
 - Right steering clutch and brake control.
 - Governor control.
 - Left brake pedal.
 - Right brake pedal.
 - Brake lock.
 - Decelerator.
 - Transmission selector lever.
 - Transmission safety lock.
 - Hydraulic blade control lever.
 - Hydraulic ripper control lever.
 - Heat start switch.
 - Circuit breaker reset.
 - Light switch.
 - Fuses.
 - Air conditioner control.
 - Heater control.
 - Fan control.
 - Disconnect switch.
 - Windshield wiper switch.

OBJECTIVE 3-2

The dozer operator will describe the function and normal range of dozer gauges.

KEYPOINTES/PROCEDURES

1. Note that abnormal and unacceptable gauge readings are covered in OBJECTIVE 3-4.

2. **Engine oil pressure gauge**

Engine oil pressure gauges monitor engine oil pressure while the engine is running. The operator should refer to the engine manufacturer's recommended oil pressure ranges for both operating and idling. Manufacturers include:

- Cummins diesel.
- Detroit diesel (GMC).
- Caterpillar.
- International.

From dozer manufacturer to manufacturer oil pressure gauges differ. Some use a color code gauge system, while others use a gauge that gives a specific reading. It is important to know how to read all types of oil pressure gauges.

3. **Engine temperature gauge and coolant pressure gauge**

The engine temperature gauge's function is to monitor engine coolant temperature while the engine is in operation. The engine coolant pressure gauge's function is to monitor engine coolant pressure within the cooling system. The engine temperature gauge thus goes hand in hand with the engine coolant pressure gauge. In order to get an accurate reading an operator must use both gauges. The temperature-pressure two gauge system is usually color-coded.

The temperature gauge has four colors; green on the lowest line with a lot of red, blue on the next or middle line with some red, and yellow on the top line with the least amount of red.

The pressure gauge has only three colors: green extending across the bottom line, blue on the next or middle line starting from the one quarter position and extending to the right, and yellow on the top line starting at the one half position and extending right.

- Green indicates — 0-3 psi in the radiator.
- Blue indicates — 3-6 psi in the radiator.
- Yellow indicates — 6-12 psi in the radiator

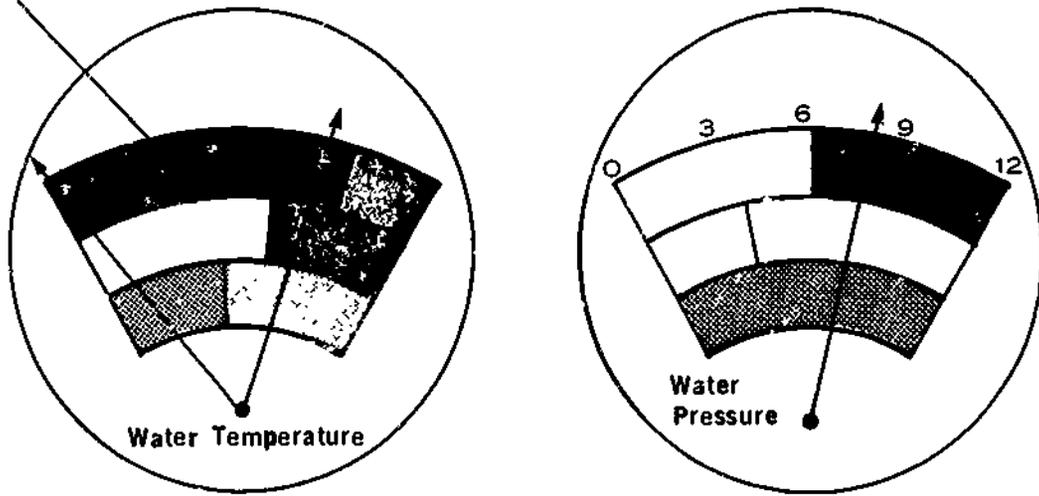
See Figure 1.

To read color-coded pressure and temperature gauges first determine what color the water pressure gauge needle is in, then check to see that the water temperature needle is in the same color or in a lesser temperature color. For example, if the pressure gauge is sitting in the green, the water temperature gauge must not go above the green. If it did, it would be in the red portion or in other words be overheating. Never allow the temperature color to be above the pressure color. Don't let the water temperature be up in the yellow or blue range and not have a corresponding pressure color.

Two gauge systems vary from manufacturer to manufacturer, but basically they follow the same principle of operation as described here. See Figure 2.

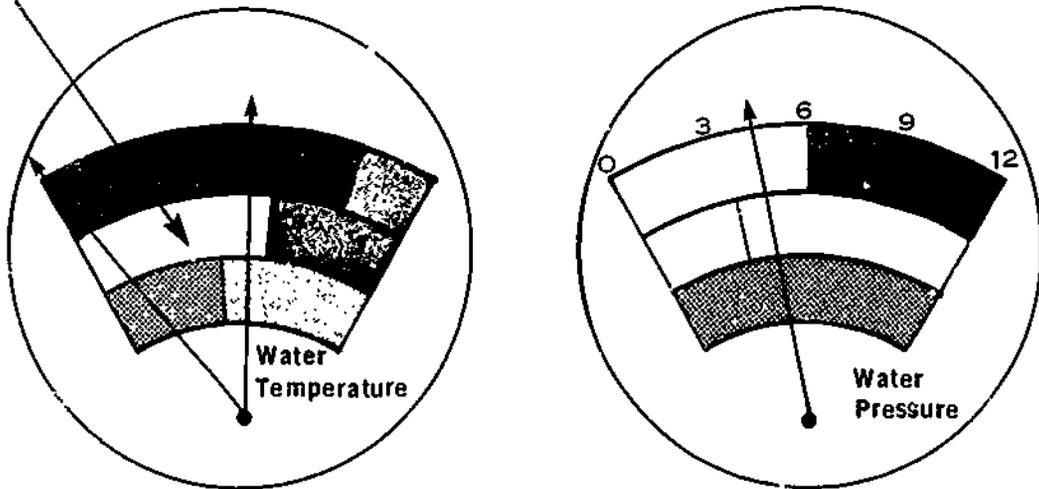
Figure 1

Effective Yellow Scale



If the water pressure needle is sitting in the yellow scale, the effective range is anywhere on the yellow scale of the temperature gauge up to the red.

Effective Blue Scale



If the water pressure needle is sitting in the blue pressure range, the water temperature can climb on the blue scale up to the red before overheating occurs.

The same is true with the green scale.

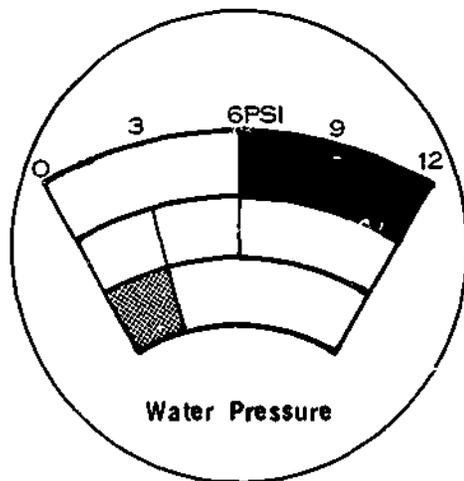
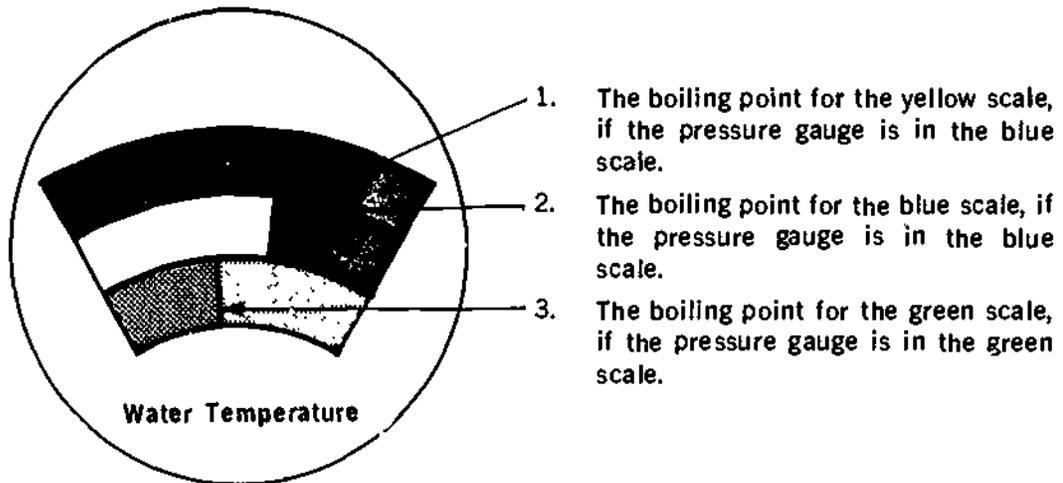
4. Ammeter gauge

The ammeter gauge monitors if the storage batteries are being charged. A positive reading is normal.

5. Fuel pressure gauge

The function of the fuel pressure gauge is to monitor the fuel pressure within the fuel system. It is color-coded; green for good pressure, red if the pressure is poor.

Figure 2



The actual effective range of each color

6. Converter oil temperature gauge

The function of the converter oil temperature gauge is to monitor the oil temperature within the converter. The gauge is color-coded: green for normal operating temperature, and red for excessive heat.

7. Hydraulic oil temperature gauge

The function of the hydraulic oil temperature gauge is to monitor the temperature of hydraulic oil within the hydraulic system.

8. Air cleaner indicator

The function of the air cleaner indicator is to identify the service requirements of the air cleaner element. For normal operating, the green band is visible. If the red indicator shows, the filter elements should be serviced.

9. Hydraulic system oil level indicator

The function of the hydraulic oil level sight glass located on the hydraulic oil tank is to monitor the level of hydraulic oil within the tank. If the hydraulic oil is visible in the sight glass, the hydraulic oil level is okay. If no oil is visible in the sight glass the dozer should be serviced immediately. For the reading to be accurate the blade and ripper assemblies must be lowered onto the ground.

10. Diesel fuel level indicator

The function of the diesel fuel level dipstick is to monitor the level of the diesel fuel in the fuel tank.

11. Engine oil level indicator

The function of the engine oil dipstick is to monitor the level of engine oil within the engine crankcase.

12. Transmission oil level indicator

The function of the transmission oil level dipstick is to monitor the level of transmission oil within the transmission.

OBJECTIVE 3-3

The dozer operator will describe the function of dozer controls and switches.

KEYPOINTS/PROCEOURES

1. **Left steering clutch and brake control**
The function of the left steering clutch and brake control is to control the left track.
2. **Right steering clutch and brake control**
The function of the right steering clutch and brake control is to control the right track.
3. **Governor control**
The function of the governor control is to control engine speed.
4. **Left brake pedal**
The function of the left brake pedal is to activate the left track braking system.
5. **Right brake pedal**
The function of the right brake pedal is to activate the right track braking system.
6. **Brake lock**
The function of the brake lock is to lock the brakes on both tracks once the brakes are applied.
7. **Decelerator**
The function of the decelerator is to control the engine speed. The decelerator works opposite to the accelerator of conventional vehicles.
8. **Transmission selector lever**
The function of the transmission selector lever is to select the direction of dozer travel, either forward or reverse, and to select a speed. Most dozers have three speeds in both forward and reverse.
9. **Transmission safety lock**
The function of the transmission safety lock is to lock the transmission in neutral. The operator must apply the transmission lock each time when leaving the seat.
10. **Hydraulic blade control lever**
The function of the blade control lever is to hydraulically control blade movements namely raising, holding, floating, and tilting (left and right).
11. **Hydraulic ripper control lever**
The function of the ripper control lever is to hydraulically control ripper movements namely raising, lowering, and holding.
12. **Heat start switch**
The function of the heat start switch is to preheat combustion chambers to help start the engine in cold weather.

Caution:

Never use starting fluid or ether with a heat start switch.

13. Circuit breaker reset

The function of the circuit breaker reset buttons is to reactivate a service lighting system that has kicked out.

14. Light switch

The function of the light switch is to activate or deactivate service lights such as headlights and dash lights.

15. Fuses

The function of fuses is to prevent damage to an electrical circuit by breaking the circuit if it becomes overloaded.

16. Air condition control

The function of the air condition control is to regulate the air conditioner.

17. Heater control

The function of the heater control is to increase or decrease the heat in the cab.

18. Fan control

The function of the fan control is to regulate air flow (low, medium or high) for both the heater and the air conditioner.

19. Disconnect switch

The function of the disconnect switch is to activate all the dozer electrical systems. Unless this switch is activated, the dozer will not run. If you are shutting down and leaving the dozer, always turn the disconnect switch OFF. If it is not turned off it will drain the storage batteries. On the other hand, never turn the disconnect switch off while the machine is operating as this will cause extensive damage.

20. Windshield wiper switch

The function of the windshield wiper switch is to activate or deactivate the windshield wipers.

OBJECTIVE 3-4

The dozer operator will describe gauge and indicator warning signals and explain the action to take for each signal.

KEYPOINTS/PROCEDURE

1. Although a gauge or indicator from one manufacturer will vary with a gauge or indicator that performs the same function from another manufacturer, both will work on the same principle. For correct readings of gauges and indicators check the operator's manual.

2. **Engine oil pressure gauge**

The engine oil pressure gauge shows the oil pressure within the engine. If the oil pressure is below an acceptable reading (see the manufacturer's specifications) the operator should shut down the dozer engine on level ground, then check the engine oil level and also look for oil leaks. Report any oil pressure problem immediately and do not operate the dozer until it has been checked by a mechanic.

3. **Engine temperature gauge**

The engine temperature gauge indicates the coolant temperature in the engine block. When the coolant temperature is high, the operator should:

- a. Check the coolant level exercising caution as the coolant is under pressure and you could suffer severe burns from it bursting.
- b. Check the engine oil level because low engine oil will cause overheating.
- c. Look for leaks in the coolant or oil systems.
- d. Check for plugging in the radiator which may require cleaning or steaming.

Many times suspected overheating can be traced to a faulty gauge or even an incorrect reading of the color-coded gauge system. Remember, color-coded temperature and pressure gauges must be read together.

Besides the problem of engines running too hot, engines running too cold can also be a problem. An operator should be aware of this fact and watch the engine temperature gauge for below normal operating temperatures.

4. **Engine coolant pressure gauge**

The coolant pressure gauge indicates coolant pressure within the cooling system of the dozer. The higher the coolant pressure, the higher the boiling point of the coolant. The pressure prevents coolant loss and boiling at high operating temperatures. The operator must watch that the engine coolant pressure is adequate for safe and efficient operating of the dozer. Refer to the operator's manual for the correct gauge reading.

5. **Ammeter gauge**

The ammeter gauge indicates if the storage batteries are being charged. A positive reading is normal. If the charge becomes negative, shut down the dozer engine and report the problem immediately. Also, check the alternator belts to ensure they are not broken or loose.

6. **Fuel pressure gauge**

The fuel pressure gauge indicates the pressure of fuel within the fuel system. The gauge is color-coded, green for good pressure and red for inadequate pressure.

Engine performance is greatly affected by the fuel pressure. In most cases when fuel pressure is inadequate, the problem is dirty fuel filters. These dirty filters should be immediately changed by a mechanic as soon as the low fuel pressure is detected.

7. Converter oil temperature gauge

The converter oil temperature gauge indicates the oil temperature within the converter. After the engine is operated sufficiently to reach a stabilized temperature, check the gauge to get a proper reading. Each dozer manufacturer has a different gauge system so consult the manufacturer's recommended reading.

8. Hydraulic oil temperature gauge

The hydraulic oil temperature gauge shows the hydraulic oil temperature within the hydraulic system. An accurate reading is taken once the dozer is operated long enough for the hydraulic oil to come up to normal operating levels. The temperature should be in the green; if it is in the red, the operator must check the oil level in the tank. If the tank is low, it should be topped up immediately. If the oil temperature continues to be high, the dozer should be checked out further by a mechanic.

Note:

Operating a dozer with the hydraulic oil low could burn out the hydraulic pump and thus be very costly.

9. Air filter indicator

The air filter indicator indicates if the air filters need to be cleaned or changed. While the dozer is operating, the indicator should be in the green. If the indicator is in the red, the filter elements should be changed or cleaned as soon as possible. The operator should be aware that a plugged filter element causing a red reading will rob the dozer of power. Loss of power, therefore, could be a sign that the air filter needs attention.

10. Hydraulic system oil level indicator

The hydraulic oil level indicator is a sight glass on the hydraulic tank. Both the blade and ripper assemblies must be lowered to the ground in order to get an accurate reading in the sight glass. The operator should check to see if oil is visible in the sight glass. If it is, the oil level is adequate; if it isn't, the hydraulic oil level should be topped up so that the oil is visible.

11. Diesel fuel level indicator

The diesel fuel level dipstick is located in the fuel tank. The dipstick gives the level in percentage of fuel left in the tank. When the fuel level has dropped to 30 percent, the operator should have the dozer refuelled immediately. Another thing the operator should do at the fuel tank is to check that the screen in the fuel filter neck is in place. Do not remove this screen.

12. Engine oil level indicator

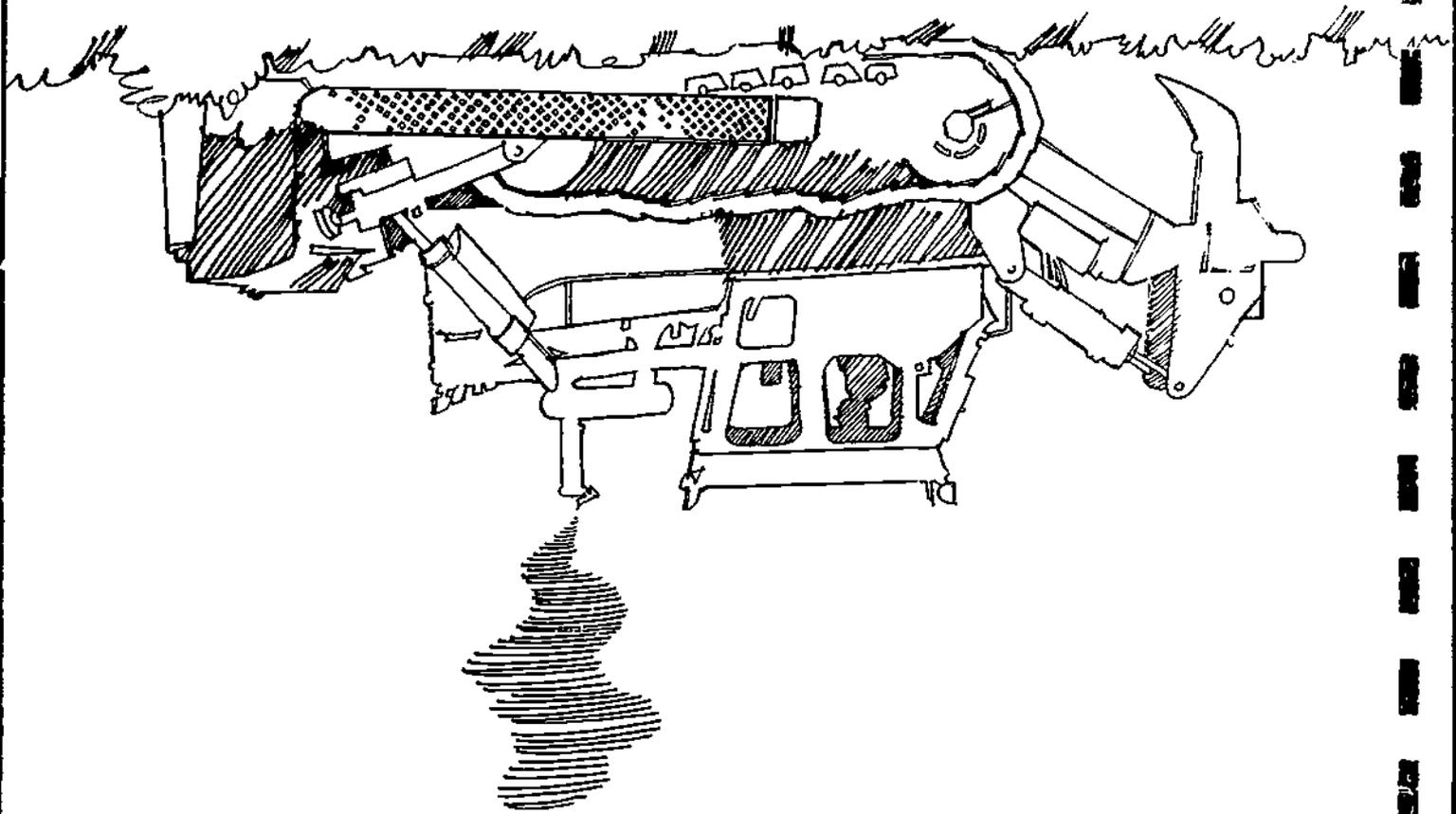
When the oil level on the engine oil dipstick reaches the add mark oil should be added to the full mark. Do not operate the dozer if the engine oil level is at the add mark or lower.

13. Transmission oil level indicator

Check the transmission oil level dipstick with the engine at low idle and the transmission in neutral. Maintain the oil level between the add and full marks. Do not operate the dozer if the transmission oil level is at the add mark or lower.

Caution:

Low transmission oil will cause the dozer to free wheel and lose braking pressure, so it is important not to operate below the add mark.



module 4

PRE-START AND OPERATIONAL CHECKS

OBJECTIVE 4-1

The dozer operator will locate and identify the basic units of a dozer and the components of the units.

KEYPOINTS/PROCEDURES

1. Undercarriage

The undercarriage is the basic assembly to which all other units of the dozer are mounted. The undercarriage components are:

- Track roller frames.
- Tracks.
- Sprockets.
- Idlers.
- Equalizer bars.
- Carrier rollers.
- Final drive case.
- Bolt on sprocket segments.
- Track shoes (pads).
- Track rollers and rock guards.
- Links.
- Pins and bushings.
- End guiding guards.
- Master link and pin.
- Hydraulic track adjusters.

2. Power train

The power train components are:

- Engine.
- Transmission.
- Torque divider.
- Final drives.
- Tracks.
- Universal joints.
- Steering clutches.
- Brakes.

3. Engine

The engine unit components are:

- Radiator assembly.
- Air cleaners.
- Alternator.
- Starting motor.

- Turbos.
- Fuel pump.

4. Case and frame assembly

The case and frame assembly is attached to the undercarriage. The components of the case and frame assembly are:

- Fuel tank.
- Hydraulic oil tank.
- Cab.
- R.O.P.S. (roll bar).
- Fenders.

5. Blade assembly

The blade assembly components are:

- Blade.
- Cutting edges.
- Corner bits.
- Blade cylinder.
- Tilt braces.
- "C" frames.
- Trunions and caps.
- Side arms.

6. Ripper assembly

The ripper assembly components are:

- Hydraulic cylinder.
- Ripper shank.
- Ripper tooth.
- Push block.

OBJECTIVE 4-2

The dozer operator will locate in a systematic sequence the pre-start and running check points on the dozer.

KEYPOINTS/PROCEDURES

1. Dozer pre-start and running check points

- The cab and the area around the dozer for personnel.
- Blade.
- Hydraulic cylinder (blade)
- C-frame pins.
- C-frame trunions.
- End guiding guards.
- Track shoes (pads and bolts).
- Track rollers and carrier rollers.
- Track pins and bushings.
- Track links.
- Master link and pin.
- Idler.
- Track roller frame.
- Drive sprocket and segment bolts.
- Final drive case.
- Track tightness.
- Hydraulic oil level.
- Ripper hydraulic cylinders.
- Ripper shank.
- Transmission and final drive leaks.
- Equalizer bar (stabilizer).
- Handrails.
- Radiator coolant level.
- Fan belts.
- Alternator belt.
- Engine oil level.
- Engine oil leaks.
- Transmission oil level.
- Fuel level.
- Lights.
- Fire extinguisher.
- Windows.
- Gauges.
- Controls.
- Seat belts.

OBJECTIVE 4-3

The dozer operator will perform a pre-start check of the dozer 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 and around the dozer for personnel and claim the machine

The operator, before commencing pre-start checks, must check the cab area for other personnel who may be working around or under the dozer. Also check for any warning flags or lock out tags. If the machine is unclaimed, claim the dozer to ensure that no one else moves the machine. Claiming means leaving a visible sign (e.g., lunch bucket, marker), that indicates you are using a particular machine.

2. Blade

Check the blade for cracks, loose or missing bolts and also check the corner bits and cutting edges for wear. Improperly checking the cutting edges or corner bits could cause extensive wear of the "frog". Also check all the pin connections and keepers where the blade is connected to the C-frame.

3. Hydraulic cylinder (blade)

Check the hydraulic cylinders on the blade for leaking hydraulic lines, for leaking cylinder ends, and for bent cylinder shafts. Check the upper trunion for missing or loose keeper bolts. Report any problems to the supervisor.

Caution:

Leaking lines or lines in poor condition could break and spray oil on the engine manifold causing a serious fire.

4. C-frame pins

Check the pins on the C-frame. The pins connect the C-frame to the blade, so make sure they are not working loose. Report any pins that may be working loose to the supervisor.

5. C-frame trunions

Check the C-frame trunions to see that the keeper bolts are in place. Check the C-frames for any missing or loose bolts. Also check for cracks in the C-frame. Report any faulty conditions.

6. End guiding guards

Check that the end guiding guards are first of all in place, then check to see if they are missing any bolts or are cracked.

7. Track shoes (pads and bolts)

Check to see if any track shoes or pads are missing. Also, check for missing track shoe bolts, making sure there are no loose shoes or pads. Loose shoes will cause bolt holes on shoes and links to wallow out. Have any missing shoes replaced immediately and have loose shoes or pads tightened. Notify the supervisor of faulty conditions.

8. Track rollers and carrier rollers

Check the rollers for wear on the:

- Roller flange caused from extensive side hill work.
- Treads caused from contact with the link rails.

Also check the:

- Roller seals for leaks.
- Cap that holds the rollers down for looseness.

The operator should keep the area around the carrier rollers clear of mud. Do not let the mud and dirt build up to a point where the carrier rollers do not turn. This condition will cause extensive wear to one side of the carrier rollers and cause flat spots.

9. Track pins and bushings

Check the track pins and bushings for wear and notify the supervisor of excessive wear. Wear on the pins increases the rate of wear on other undercarriage components.

Note:

Extensive travelling in reverse increases wear on the pins and bushings. Backing up must always be done slowly. High speed reverse operation is the most deadly enemy of pins and bushings.

10. Track links

Check for link wear caused by contact with the rollers and idlers. Check the working clearance between the roller flange and the pin boss. As a dozer is used this clearance is reduced and without proper maintenance will result in link and roller flange contact. Advise the supervisor immediately if this condition is found.

11. Master link and pin

Check the master pin, making sure that it is not working itself out. In the case of Caterpillar dozers, check the split master link to make sure that the link bolts are tight and are not working loose. Report any faulty conditions to the supervisor.

12. Idler

Check the front idler for excessive wear and cracks. Wear on just one side means the idler is off center. Excessive wear on both sides means the wear strip on the idler is worn out. Also, the roller frame could be out of alignment. Idler flange wear is caused by excessive side hill work. Report any problems to the supervisor.

13. Track roller frame

Check the track roller frame for cracks or breaks (these are uncommon but they have happened). Report any cracks or breaks to the supervisor and do not operate the dozer until it is repaired.

14. Drive sprocket and segment bolts

There are three factors governing sprocket wear:

- Excessive internal pin and bushing wear causing increased track pitch.
- High speed in reverse. This causes one of the most severe types of sprocket wear.

- Packing of dirt or clay in the sprocket tooth forcing the bushings to slide up on the sprocket teeth.

Check the sprocket for broken or worn teeth. Report any excessive wear or broken teeth to the supervisor. Drive sprockets are equipped with segments. A broken tooth on a segment can be changed, and if extensive wear is occurring the segments can be rotated for longer sprocket life. A major problem with segments is loose or missing bolts, so check for these. Report any sprocket wear to the supervisor.

15. Final drive case

Check the final drive case for missing or loose bolts and report any that are found. Also check the case area for leaks and report any abnormal conditions to the supervisor.

16. Track tightness

Tracks can be visually checked for tightness. The tracks should not sag any more than 1 1/2" to 2". Excessive slack in the tracks causes unnecessary wear. Notify the supervisor of slack tracks immediately and have the tracks adjusted.

17. Hydraulic oil level

The hydraulic oil level is checked with the blade and ripper lowered and the engine at low idle. The transmission should be in neutral and the brakes engaged. The hydraulic oil should be visible in the sight glass on the hydraulic tank. If the oil is not visible, report the condition to the supervisor and have it corrected.

18. Ripper hydraulic cylinders

Check the bottoms of the hydraulic cylinders on the ripper for leaks. Also check the hydraulic lines for leaks. Check the place where the cylinders connect to the ripper assembly making sure the keepers are not missing and are secure.

19. Ripper shank

Check the ripper shank for cracks. Make sure the ripper tooth is neither missing nor excessively worn. Check to see that the shank protector is not missing. Report any abnormal conditions to the supervisor.

20. Transmission and final drive leaks

Check the transmission and final drive for oil leaks. Report any excessive oil found in these areas.

21. Equalizer bar

Check the equalizer bar for cracks or breaks and also for missing or loose bolts. Report any damage to the supervisor.

22. Handrails

Make sure all handrails are intact. Report any broken rails to the supervisor.

23. Radiator coolant level

The operator should check the radiator coolant level with the engine stopped. Use extreme caution when removing the cap because the coolant is hot and under pressure and could cause injury.

Maintain the coolant level within one half inch of the bottom of the filler pipe. If a low coolant level is found, contact the supervisor immediately.

24. Fan belts

The operator should visually check to see that the belts are in place, tight and in good condition.

25. Alternator belt

The operator should check that the belt is in place, tight and in good condition.

26. Engine oil level

The engine oil level must be checked at the beginning of each shift with the dozer as level as possible. Depending on the engine in the dozer, the engine may have to be running or shut down for the oil check. A GM engine needs to be shut down to check the oil. Once the engine is down wait for five minutes before checking the oil level. This will give the oil time to settle back into the oil pan for a proper reading. Other engines, for example Cat engines, have to be running to check the oil level accurately.

The oil level on Cummins engines can be checked either with the engine running or stopped. Engines that can be checked running or stopped have two readings on their dipsticks. The operator must make sure to read the side of the dipstick appropriate to the engine either running or being stopped. If the engine oil level is on the add mark or below do not use the dozer in a production situation. Report the low engine oil level to the supervisor immediately.

27. Engine oil leaks

The operator should look for engine oil leaks while doing the oil level check. There may be oil lines or gaskets that are leaking. Make a visual check to see if oil is dripping or running down the side of the engine block while the engine is running. Also check the turbochargers for excessive oil leaks and at the same time check for loose components in the turbocharger area.

28. Transmission oil level

Check the transmission oil level with the unit parked on as level a surface as possible. The oil level on the dipstick, should be close to the full mark. If it is on the add mark, add oil immediately before beginning production.

29. Fuel level

To check the fuel level within the fuel tank, the operator must remove the cap on the fuel tank, pull out the dipstick that is in the tank and read what percentage of fuel is left. It is recommended that the operator call for fuel once the fuel level reaches 30 percent.

30. Lights

Check to make sure all lights are operational. Should any not work, report the condition to the supervisor and have it corrected.

31. Fire extinguisher

Check to make sure the fire extinguisher has not discharged. If it is discharged report to the supervisor for immediate replacement.

32. Windows

Check all windows for broken glass. Report any broken windows to the supervisor. Windows should be kept clean at all times.

33. Gauges

Check all cab gauges to ensure they are operational. Report faulty gauges because they must be replaced.

34. Controls

Check all controls to ensure they are functioning properly. Report any abnormal conditions in the controls to the supervisor.

35. Seat belts

Check that the seat belts are not excessively worn and that the connectors are working properly. Operators on dozers must use seat belts at all times. Rule 277 (c), Section 23, in the *Mines Regulation Act* state:

Lap seat belts of an approved type shall be installed in all mobile equipment fitted with a roll-over protective structure, and it shall be the duty of the operators of such equipment to wear the seat belts at all times.

OBJECTIVE 4-4

The dozer operator will perform proper engine start-up and shut down procedures.

KEYPOINTS/PROCEDURES

1. Start-up and shut down procedures vary between manufacturers. Check the dozer operator's manual for the correct procedures.

2. **Start-up**

Follow these procedures to start the engine at temperatures above 60°F or 16°C:

- a. Ensure that all personnel and equipment are clear of the dozer.
- b. Apply both foot pedals and engage the brake lock.
- c. Place the transmission control lever in neutral.
- d. Engage the transmission control safety lock.
- e. Move all hydraulic controls for the ripper and blade assemblies to the hold position.
- f. Pull the governor or throttle lever to just over the detent position which is about one quarter engine speed.
- g. Depress the start switch.
- h. As soon as the engine starts, release the start switch.

3. **Shut down**

Follow these procedures to shut down the engine:

- a. Park the dozer on a safe, level area.
- b. Lower all equipment (the blade and ripper) to the ground.
- c. Move the transmission control lever to neutral.
- d. Reduce the engine speed to an idle using the governor or engine speed control lever. Let the engine idle from three to five minutes so that the engine will cool gradually and uniformly. This idling time also allows the turbochargers time to slow down and cool.
- e. Engage the transmission control safety lock.
- f. Apply the brake pedals and engage the brake lock.
- g. Push the governor or engine control lever off and the engine will stop.
- h. Turn off the motor switch or the disconnect key.
- i. Clean the tracks of all mud or foreign material.

OBJECTIVE 4-5

The dozer operator will perform operational checks on the brakes, steering and hydraulic controls prior to putting the dozer into production. The operator must describe both the acceptable conditions for each check and the conditions that should be reported to a supervisor.

KEYPOINTS/PROCEDURES

1. Brakes

To check the brakes, put the dozer transmission into the first speed, move the dozer forward, then apply the brakes. If the dozer stops, the brakes are okay. If the brakes do not hold the dozer, report the brakes to the supervisor and have them repaired before putting the dozer into production.

2. Steering

To check the steering on a dozer, you must check two steering clutches:

- a. Put the dozer into motion at a very low speed.
- b. To check the right steering, pull the right steering clutch lever all the way out and the dozer should turn to the right. For a sharper turn apply the right brake foot pedal at the same time. For a slow, gradual turn pull the steering lever slightly out and the dozer should turn slowly to the right.
- c. Similarly check the left steering. Pull the left steering clutch lever all the way out and the dozer should turn to the left. For a sharper turn, apply the left brake foot pedal at the same time. For a slow, gradual turn pull the lever out until the desired speed of turn is achieved.
- d. Some models are equipped with the steering and braking functions combined in the steering levers. On these models the operator can pull the steering clutch lever and have the desired turn at a gradual speed. The operator also has the option of pulling the lever completely out and this applies the brakes on the desired turning side for a tight turn. Thus the use of the foot brake pedal in applying tight turns is eliminated with these models.

Caution:

Improper use of the steering lever can cause a slow deterioration of the steering on a dozer. The steering responses can progressively get worse or there can be a complete failure of steering control. Report all steering problems and do not operate the dozer until the problems are corrected.

3. Hydraulic controls

The operator must check the response of the hydraulic controls for both the blade and the ripper assemblies at the beginning of each shift prior to going into production. Once the dozer has reached operating temperature and with the engine running:

- a. Check the hydraulic control response for the blade and check the raise, hold, lower and float positions.
- b. Check the blade tilting capabilities by first lowering the corner of the blade to the left side and then lowering the corner of the blade to the right side.
- c. Check the hydraulic ripper controls for response, raise, lower and hold. Check the controls for the minimum and maximum tooth angle response.

- d. Report any malfunctions to the supervisor.

Note:

Operators should never drop the blade onto the ground because this can cause extensive damage to the machine.

OBJECTIVE 4-6 (optional)

The dozer operator will describe proper procedures for a cold weather start of the dozer engine.

KEYPOINTS/PROCEDURES

1. See OBJECTIVE 4-4 for engine start-up procedures.
2. There are two systems used in cold weather starting of dozers: ether starting fluid and glow plugs. Some manufacturers use only ether starting fluid to aid the starting of cold engines where as other manufacturers such as Caterpillar use either glow plugs for cold starting or ether starting fluid. Note that on Cat dozers either one or the other system is used; never a combination of the two.

3. Ether starting fluid method

There are two methods of starting an engine using a starting fluid: ether injectors or ether from an aerosol can.

Ether injectors

Before attempting to start the engine, check the ether container to ensure that a supply of starting fluid is available. Ether injection is controlled by a push button on the dash. The location of this button varies for different manufacturers.

Note:

Use the ether injector system only for starting. Misuse of the ether injector while the engine is running can result in serious damage to the engine.

Ether starting fluid in an aerosol container

While pressing the starter switch to activate the starter, spray starting fluid into the air cleaners. Be sure to hold the spray can far enough back from the filters so that they do not become saturated with fluid. Continue spraying until the engine starts and runs smoothly.

Note:

If the engine does not start, do not keep turning the engine over and spraying starting fluid into the air cleaners. The starting fluid dries the cylinder walls out and could cause damage. The operator must ensure that all aerosol cans are clear of the cab.

4. Glow plug system

Caterpillar uses the glow plug system:

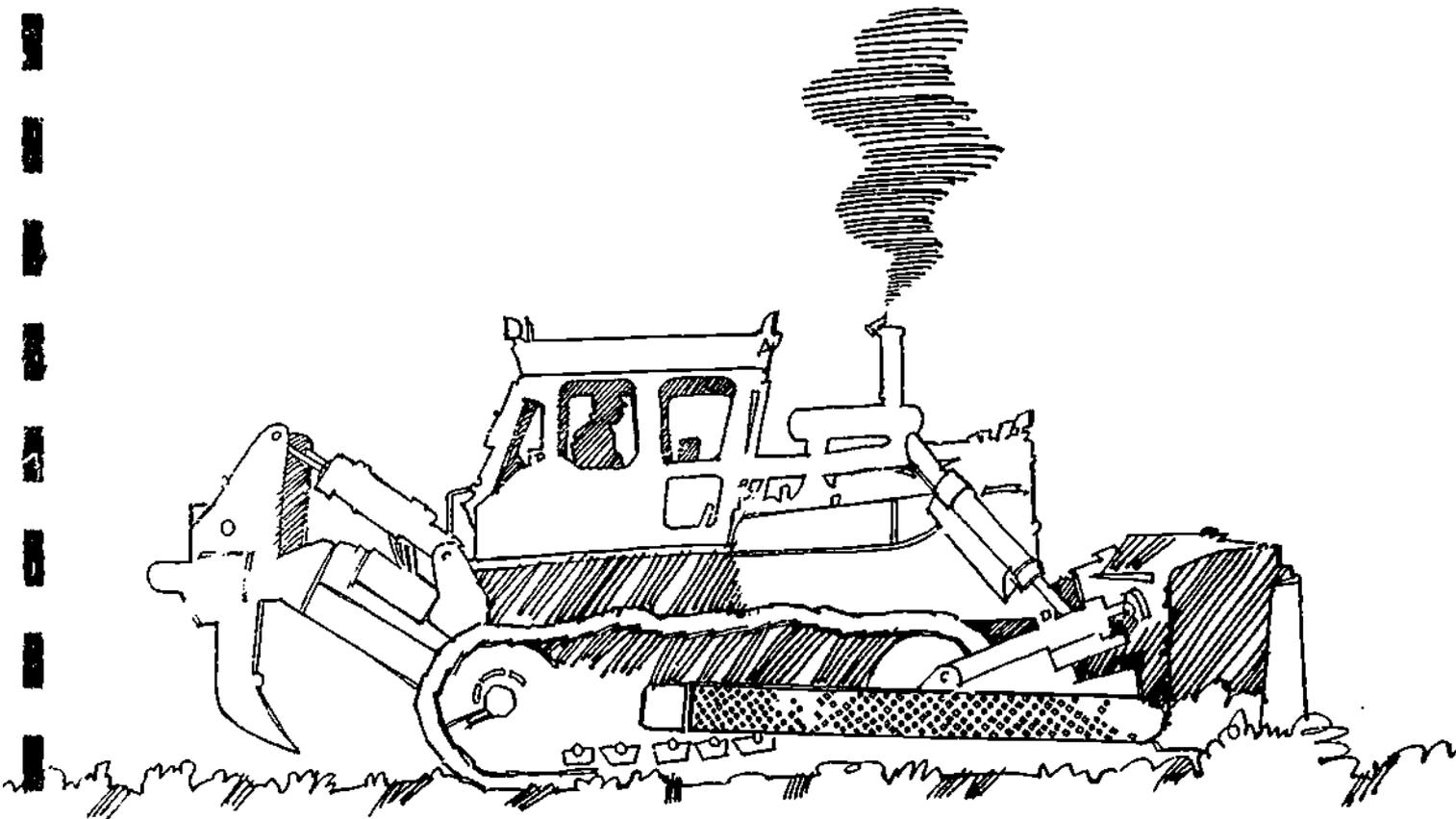
- a. Push in and turn the heat start switch to heat for an indicated time. The colder the temperature the longer the heat is applied. Caterpillar dozers are equipped with a starting aid chart in the cab. This chart will assist the operator on glow plug times for different temperatures.
- b. Once heat has been applied for the indicated time, turn the heat start switch to start.
- c. Release the switch as soon as the engine starts.
- d. Once the engine has started it may be necessary to return the heat start switch to heat and apply the heat until the engine runs smoothly.

Caution:

Never switch to heat once the engine is warm and running. Most important, never use glow plugs and ether at the same time; this is very dangerous.

BASIC DOZER OPERATION

module 5



OBJECTIVE 5-1

The dozer operator will demonstrate moving the dozer forward in normal operating conditions and slow in close quarters.

KEYPOINTS/PROCEDURES

1. Normal forward motion

To move the dozer forward:

- a. Ensure the area is clear of personnel and equipment.
- b. Make sure, once the dozer is started, that all gauges come up to the proper readings.
- c. Pull the governor or engine speed control lever to the desired speed.
- d. Raise all lowered equipment (the blade and ripper) high enough to clear obstructions.
- e. Push down on both brake pedals and release the brake locks.
- f. Depress the decelerator pedal to decrease the engine speed to low idle.
- g. Move the transmission control lever to first speed forward.
- h. With the decelerator pedal held depressed, move the governor or engine speed control lever to high idle.
- i. While performing procedure h, make sure that one foot is on the foot brake to hold the dozer stationary.
- j. Take your foot off the brake pedal and slowly let your other foot off the decelerator pedal allowing the dozer to move smoothly forward. The further you release the decelerator pedal, the faster the dozer will travel until it reaches its maximum speed in first gear. Remember the decelerator works opposite to the accelerator of any conventional vehicle.

2. Slow movement

For slow, forward movement use the same procedures as in point 1, except put the governor or engine control lever at low idle rather than high idle. The dozer speed is controlled with the decelerator pedal.

OBJECTIVE 5-2

The dozer operator will demonstrate operating the dozer in reverse both in a non-production and a production situation.

KEYPOINTS/PROCEDURES

1. Normal reverse motion

To reverse the dozer:

- a. Ensure that the area is clear of personnel and equipment.
- b. Make sure, once the dozer has been started, that all gauges come up to the proper readings.
- c. Pull the governor or engine speed control lever to the desired speed.
- d. Raise all lowered equipment (the blade and ripper) high enough to clear obstructions.
- e. Push down on both brake pedals and release the brake locks.
- f. Depress the decelerator pedal to decrease the engine speed to low idle.
- g. Release the transmission safety lock.
- h. Move the transmission control lever to the first speed in reverse.
- i. Holding the decelerator pedal depressed, move the governor or engine speed control lever to high idle.
- j. While performing procedure i, make sure that one foot is on the foot brake holding the dozer stationary.
- k. Take your foot off the brake pedal and slowly let your other foot off the decelerator pedal allowing the dozer to move smoothly backward. The further the operator releases the decelerator pedal the faster the dozer will travel until it reaches its maximum speed in first gear.

Reverse travel should be kept to a minimum to prevent excessive wear on all components.

2. Reversing in production

In production when the operator is pushing material forward and then wants to go into reverse, a directional shift is possible at full engine speed. However, a full speed directional change is hard on the power train components and will consequently shorten the life of the equipment. A full speed directional change is also hard on the operator. Therefore, it is recommended that instead of making full speed directional changes the operator:

- a. Decrease the engine speed by pushing down on the decelerator.
- b. Apply one of the foot brakes to bring the dozer to a stop.
 - c. Move the transmission lever to the desired reverse speed.
 - d. Release the brake pedal.
 - e. Release the decelerator pedal at the same time as releasing the brake pedal.

Caution:

Never use the brake pedals as foot rests.

OBJECTIVE 5-3

The dozer operator will demonstrate proper steering procedures to turn the dozer on level ground and on grades.

KEYPOINTS/PROCEDURES

1. Gradual turns

Gradual right turns

- a. Pull the right steering lever back fully releasing the right side clutch and causing the dozer to turn gradually to the right.

Gradual left turns

- a. Pull the left steering lever back fully releasing the left side clutch and causing the dozer to turn gradually to the left.

When making turns, always make sure that the opposite steering lever is pushed back in, or in other words that it is not partially out and therefore engaged. Dozers that have been in production for a long time may have steering levers that stick and cause this problem.

2. Sharp turns

Sharp right turns

- a. Pull the right steering lever back fully.
- b. Apply the right foot brake. The amount of pressure applied will determine the tightness of the turn.

Sharp left turns

- a. Pull the left steering lever back fully.
- b. Apply the left foot brake. The amount of pressure applied will determine the tightness of the turn.

Sharp turns should be avoided whenever possible because they cause excessive wear on the machine.

OBJECTIVE 5-4

The dozer operator will demonstrate proper techniques when operating a dozer on a downgrade.

KEYPOINTS/PROCEDURES

1. Downgrade operations

- a. Choose the path of travel for the dozer.
- b. All travelling on downgrades should be in first gear only.
- c. Load the blade with material.
- d. If it is not possible to load the blade, keep the blade close to the ground.
- e. Steer in the normal fashion. If the blade is empty, then use the clutch and foot brake to ensure that cross steering does not occur.
- f. Tilt the blade left or right to help steer.

2. Steering

For gradual turns on downgrades, always pull the opposite lever to the direction of the desired turn i.e., to turn right pull the left steering lever and to turn left pull the right lever.

For sharp turns on downgrades, apply the standard steering procedures.

Gradual right turn

- a. Pull the left steering lever back fully. This releases the left side steering clutch and the dozer will turn to the right.

Gradual left turn

- a. Pull the right steering lever back fully. This releases the left side steering clutch causing the dozer to turn left.

Sharp right turn

- a. Pull the right steering lever back fully.
- b. Apply the right foot brake. The degree of pressure applied will determine the tightness of the turn.

Sharp left turn

- a. Pull the left steering lever back fully.
- b. Apply the left foot brake. The degree of pressure applied will determine the tightness of the turn.

Caution:

Never put the dozer into neutral and let it coast down hill uncontrolled.

3. Caterpillar dozers

Some Caterpillar dozers are designed with the steering clutch levers and the brakes combined.

Gradual right turn

- a. Pull the right steering clutch lever to detent and the dozer will turn gradually.

Sharp right turn

- a. Pull the right steering clutch lever past detent causing the brakes to be applied. The further you pull back the lever, the greater the braking pressure. When the lever is fully back, the dozer will make a sharp right turn.

For left turns apply the same procedures as for right turns using the left steering clutch lever.

OBJECTIVE 5-5

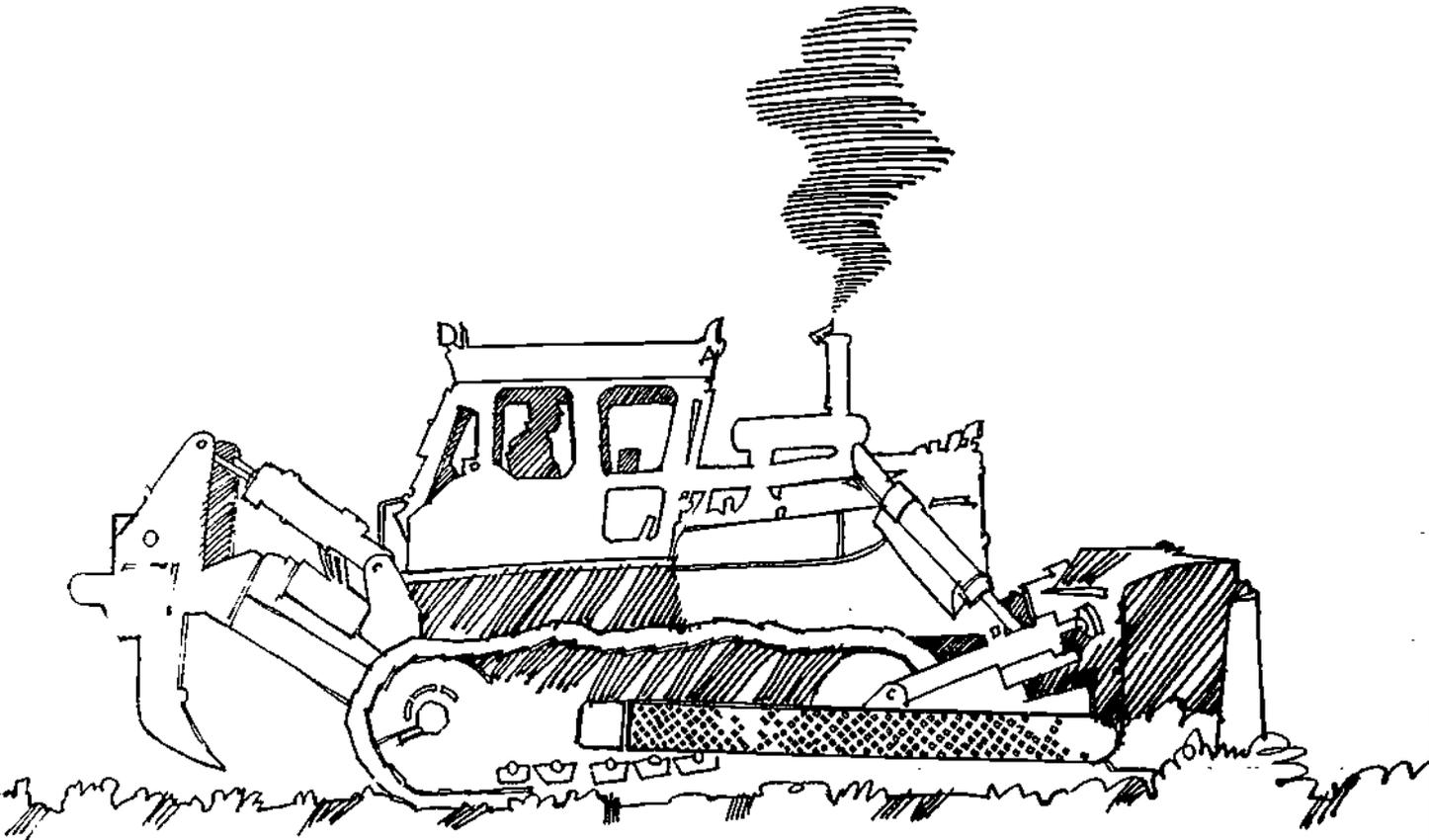
The dozer operator will demonstrate the proper techniques to stop and park the dozer.

KEYPOINTS/PROCEDURES

- 1. Parking**
 - a. Find as safe and level an area as possible to park the dozer.
 - b. First reduce the engine speed to an idle with the decelerator foot pedal, and then disengage the governor control lever.
 - c. Move the transmission control lever to neutral.
 - d. Engage the transmission control safety lock.
 - e. Apply both brake pedals and engage the brake lock.
 - f. Lower all the hydraulic equipment (the blade and ripper) to the ground.
 - g. After a cooling down period of five minutes, push the governor control lever fully off and the engine will stop.
 - h. Turn the disconnect switch off and remove the key. Failure to do this will cause the storage batteries to run down.

DOZER PRODUCTION OPERATION

module 6



OBJECTIVE 6-1

The dozer operator will demonstrate proper dozing and digging techniques.

KEYPOINTS/PROCEDURES

1. The dozer is worked by moving it backwards and forward while at the same time working the blade up and down so that material can be moved from one place to another, spread around, or dug.
2. Procedures prior to beginning dozing
 - a. The operator should analyze the job before commencing work:
 - Are there any people or equipment in line with the pushing direction?
 - What type of material is to be pushed?
 - What amount is to be moved?
 - b. Whenever possible begin all jobs from the most level area available and dig and move material downgrade because this is the easiest and most efficient way to work.
3. Dozing and digging procedures
 - a. Use the lowest gear when pushing in production and never spin the tracks.
 - b. With the dozer moving ahead, slowly lower the blade into the ground, until the desired depth of cut is established. As the dozer moves ahead and starts to dig, the material being cut by the blade will build up in front of the blade and travel along with the dozer.
 - c. During the push, should the blade dig too deeply into the ground, raise the blade slightly and continue with an even cut.
 - d. When pushing a heavy load the speed of the engine will drop. This is normal. However, if the engine begins to stall, the tracks begin to spin, or the gauges (especially the torque converter) begin to rise, raise the blade slightly cutting down the resistance and allowing the dozer speed to regulate itself.
 - e. To keep the dozer pushing at an even speed, you can raise and lower the blade rapidly with a pumping action on the blade control.

OBJECTIVE 6-2

The dozer operator will demonstrate the proper ripping techniques.

KEYPOINTS/PROCEDURE

1. **Procedures prior to beginning ripping**
 - a. The dozer operator should analyze the project in order to become aware of the:
 - Size of the area to be ripped.
 - Type of material to be ripped.
 - Way the layers of material are lying.
 - Depth the material is to be ripped.
 - Spacing between passes.
 - Direction the ripping should take for ease of production (rip downhill whenever possible).
 - b. The dozer operator decides on the method of ripping based on the:
 - Type of material.
 - Composition of the material layers
 - Hardness of the material.
2. **Ripping procedures**
 - a. With the dozer moving forward in the lowest gear, make several shallow passes across the area to be ripped. These passes should only be a few inches deep. The purpose of the shallow sweep of the area is to allow the dozer better traction during ripping.
 - b. With the dozer moving forward, lower the ripper deep into the material.
 - c. Once the dozer begins labouring or slowing down raise the ripper slightly until the dozer starts to work normally once again.
 - d. Move through the material at a steady pace. Use the decelerator pedal to maintain a smooth, steady pace as well as to keep track spinning to a minimum.
 - e. Keep the dozer on the full track. Excessive down pressure will cause the rear of the dozer to lift forcing the equipment to travel on the front idlers.
 - f. Keep the ripper passes close to one another so that the size of the material is small.
3. In tough material the shank penetration will vary. It is desirable to rip as deep as possible but at times it is better to rip and remove the material in its natural layers.
4. Changing the angle of the shank on entry into the material will make penetration easier. Once penetration is achieved, the angle can be changed again for more effective ripping.

Caution:

Never try to steer the dozer with the shank in the ground.

Never put the dozer in reverse when the shank is in the ground.

OBJECTIVE 6-3

The dozer operator will demonstrate the proper techniques for levelling piles of material.

KEYPOINTS/PROCEDURES

1. Procedure prior to levelling a pile
 - a. The dozer operator must choose the method of approach when faced with levelling a pile of material. There are two choices:
 - Approach from the side.
 - Cut the top off the pile.The operator should choose the method that is both safe and efficient.
2. Procedures to push a pile from the side
 - a. Approach the pile from the most desirable side.
 - b. Set the blade at the level the material is to be spread.
 - c. Take a cut about one-half the blade width.
 - d. Chose the direction of the side cut based on the size of the area the material is to be spread over.
3. Procedures to control high faces
 - a. During the process of levelling, should a high face form at the side of the pile, start a push or cut and as the dozer is travelling forward, turn the dozer into the face gradually. At the same time raise the blade. This action will cut down the face.
 - b. Back the dozer up to the point where it first turned into the face.
 - c. Set the blade at the desired level and continue with a normal push.
 - d. The safe depth of the cut will vary with the type of material.

Caution:

Pay close attention to the high faces on either side of the dozer. If neglected, these high faces could possibly become a hazard to the operator and the dozer.
4. Procedures to cut the top off the pile
 - a. In some cases you may have difficulty reaching the top of the pile with the dozer. In such cases it is necessary to construct a small ramp by first running the dozer part way up the pile and backblading some of the material down.
 - b. Once the ramp is made, move to the top of the pile and begin pushing.
 - c. Form a slot through the middle of the pile. This slot should be kept wider than the blade.
 - d. Once the dozer has cut down the center of the pile to the desired level there will be two piles remaining, one on either side. With the two piles made revert to the side method to complete the job of levelling.

OBJECTIVE 6-4

The dozer operator will demonstrate the proper methods of spreading material.

KEYPOINTS/PROCEDURES

1. **Procedures prior to spreading**
 - a. Evaluate the job before commencing work:
 - Observe the area the material is to be spread over.
 - Note the coarseness of the material.
 - Note the amount of material involved.
 - Know how thick to spread the material.
2. **Spreading procedures**
 - a. With the dozer in forward motion, enter the material pile with the blade at the desired height.
 - b. Move the dozer forward pushing the material. The material will flow under the blade leaving behind the required spread.
 - c. If the spread requires a specific thickness, the operator should make allowances for compaction. Materials compact differently, e.g., some materials may require double the thickness in spreading in order to allow for loss during compaction. Through experience and trial and error the operator will learn to judge the ratio of spread to compaction to achieve the desired depth of spread.

OBJECTIVE 6-5

The dozer operator will demonstrate proper techniques for transporting material.

KEYPOINTS/PROCEDURES

1. General transporting procedures

- a. When transporting material, the dozer operator may find it necessary to keep the blade cutting throughout the full length of the push in order to maintain a full blade of material.
- b. Excess material will roll off the sides of the blade during the first push and form a trough. The dozer operator can use the same path on the second push and thus make use of the trough to hold material on the dozer blade.
- c. Slot dozing is a method that allows the dozer to transport the maximum amount of material. Once the slot is formed, the sides of the slot will hold the material on the dozer blade and allow larger loads to be carried by the blade. Slot dozing is an excellent method for high production dozing.

Caution:

Use extreme caution where high faces form on the sides of the slot. If neglected, these high faces could prove dangerous to both the operator and dozer.

2. Transporting fine material

Fine material is relatively easy to transport. Once the blade is full of material, maintain the blade at surface level cutting slightly. This action will ensure that the blade remains full throughout the remainder of the push.

3. Transporting coarse material

Transporting coarse material such as rock is much more difficult than transporting soft material. The dozer will labour when it comes up against large rocks lodged deeply into the ground. The operator has the option of either digging out the embedded obstruction or raising the dozer blade and travelling around the obstruction.

4. Procedures for making minor changes of direction

- a. To tilt left simultaneously pull the left steering clutch lever and apply the left brake. This action will cause the dozer to turn to the left. You can assist the turn by feathering the steering lever.
 - b. To tilt right, simultaneously pull the right steering clutch lever and apply the right brake. This action will cause the dozer to turn to the right.
 - c. In order to get the load turned, you can gradually lift or tilt the blade while making the minor turn.
 - d. A minimal portion of the load will be lost when lifting the blade, but you can pick up this lost material when the dozer makes the next push.
5. Turns made while pushing a load are not recommended and should be kept to a minimum. Push in a straight forward line whenever possible. Major change of direction should be accomplished by repositioning the dozer.

OBJECTIVE 6-6

The dozer operator will demonstrate the proper techniques for piling material.

KEYPOINTS/PROCEDURES

1. Procedure prior to piling
 - a. When piling material with a dozer, first consider the size of the area for the pile. The pile can be high for a restricted area or spread out for an ample area.
2. Piling procedures
 - a. Make a series of pushes leaving behind several small piles.
 - b. Ramp up on top of these small piles, then repeat with another series of pushes making small piles once again.
 - c. Continue this procedure until reaching the desired height. The pile usually builds back to where the push was started.
 - d. Once the required pile height is achieved, push over the edge of the pile.
 - e. When approaching the edge of the pile, slowly lift the blade before reaching the edge. The dozer will travel on top of the material that passes under the blade and compact it for a more stable and safe working edge.

Caution;

Use extreme caution when pushing material over an edge.

OBJECTIVE 6-7

The dozer operator will demonstrate proper shallow ditching techniques.

KEYPOINTS/PROCEDURES

1. **Procedure for tilt dozer ditching**
 - a. Tilt or lower the desired corner of the blade.
 - b. With the dozer moving forward, lower the corner bit into the ground at the desired depth of cut. This will be the center of the ditch.
 - c. Push material the full length of the ditch, then push excess material to a place out of the way.
2. **Procedures for straight dozer ditching**
 - a. Tilt or lower the desired corner of the blade.
 - b. With the dozer moving forward, lower the corner bit into the ground and push. This cut will leave a shallow V-shaped ditch.
 - c. The bottom of the V will serve as the center of the ditch.
 - d. For larger ditches, push at right angles to the center of the V-shaped ditch. Push the material down one side of the ditch and up the other side leaving material on one side only.
 - e. Once the desired depth and length is achieved, push the material down on either side of the ditch to give the job a finished look.

OBJECTIVE 6-8

The dozer operator will demonstrate the proper techniques for building a ramp.

KEYPOINTS/PROCEDURES

1. The building of ramps is a technique used for constructing roads.
2. **Ramping down procedures**

Go from one bench to another by constructing a ramp:

 - a. Before starting the job, make sure there are no personnel or equipment in the area where you will be pushing material.
 - b. Work the material from the upper bench to the lower.
 - c. Remove the front material of the upper bench, pushing the material down.
 - d. Cut the material down at a slight grade keeping in mind what will use the ramp once it is finished, e.g. large haulage trucks.
 - e. Work back from the first cut and push material forward down the grade.
 - f. Work the material to the side to gain the width needed and to the front edge until the ramp has reached the lower bench and has become an adequate ramp for travel.
3. **Ramping up procedures**

To construct a ramp up, the material is hauled in and pushed:

 - a. Haul a series of loads hauled in and dumped so the loads are the full width of the proposed ramp.
 - b. Push the material upwards building a slight incline.
 - c. Have another series of loads hauled in and dumped on the edge.
 - d. Push material over the edge; this will build the ramp upwards at a slight incline.
 - e. Repeat these procedures until the ramp is completed.

OBJECTIVE 6-9

The dozer operator will demonstrate the proper techniques for moving large boulders or rocks.

KEYPOINTS/PROCEDURES

1. **Procedures to roll large rocks or boulders:**
 - a. With the dozer moving forward in first gear at low speed, lower the blade to where it is just clearing the ground. Once contact is made with the rock proceed slowly.
 - b. While pushing the rock, raise the blade slowly. The rock will then roll more easily to where you want it to go.

Caution:

It is important to use caution when moving large rocks to ensure that the blade does not catch an edge of the rock causing the rock to tip over into the blade.

2. **Procedures to jockey large boulders or rocks:**
 - a. Boulders and rocks that will not roll and cannot be pushed straight on can be jockeyed from side to side in order to move them.
 - b. Contact the rock on one side first and push it, then go to the other side and push in the same direction.
3. **Procedures to push out a large rock or boulder that is partially embedded:**
 - a. Tilt the blade to the desired side.
 - b. With the dozer moving forward, contact the embedded rock with the lowered corner bit.
 - c. With the dozer pushing forward and the corner bit dug into the rock, slowly raise the blade. This action should dislodge the rock.
 - d. Repeat these procedures until the rock is worked completely free.
 - e. If the rock doesn't move, trench around the rock to expose it and then repeat the procedures.

OBJECTIVE 6-10

The dozer operator will demonstrate the proper method for developing sidehill cuts.

KEYPOINTS/PROCEDURES

1. **Procedures to establish a shelf as a starting point**
 - a. Establish a safe working area. Clear above and below. The shelf should be wide enough to provide a solid base for the dozer to work on.
 - b. Develop the starting point to ensure the sidehill cut is level or angled into the slope away from the edge.
2. **Sidehill cut procedures**
 - a. Move the material for the sidehill cut from the solid to the outside edge.
 - b. With the dozer moving forward and the blade at the desired height, start the cut with the blade in as much solid material as possible.
 - c. Once the dozer reaches a point where the shelf narrows, whether the blade is full or not, swing the load to the outside edge.
 - d. Keep following these procedures until an adequate footing is established. The material being pushed over the edge will widen the shelf or cut enabling the dozer to continue operating on level ground in addition to providing a solid and wide working area.
 - e. Repeat these procedures until the sidehill cut is completed.

OBJECTIVE 6-11

The dozer operator will demonstrate the proper technique for cleaning up the shovel area.

KEYPOINTS/PROCEDURES

1. Procedures prior to cleaning a shovel area
 - a. Make sure the truck operators, shovel operator and ground personnel are aware of the dozer's presence in the working area before starting work. If radio contact cannot be made, enter the area on the cab side of the shovel to ensure that the shovel operator is aware of the dozer's presence.
 - b. The dozer should never enter the shovel counterweight swing radius. Note that even though a dozer is out of the counterweight swing radius, it could still be within the bucket swing radius.
2. Procedures to clean up the shovel area
 - a. Follow the basic dozing procedures of operation.
 - b. With the dozer moving forward and the blade contacting the ground surface, push all sharp rocks and spillage back into the face area.
 - c. Push the material into a position where the shovel operator can reach it and load it out.
 - d. Do not push the material into the path of the shovel tracks.
3. The dozer operator can assist in maintaining proper grades by either cutting or filling in at the shovel area.

OBJECTIVE 6-12

The dozer operator will demonstrate the procedures for cleaning up after a blast.

KEYPOINTS/PROCEDURES

1. Cleaning up after a blast is a basic dozing operation. The dozer operator must deal primarily with fly rock that has landed on the haul roads and within the shovel working area.
2. **Procedures for cleaning up fly rock**
 - a. Push the fly rock with the dozer moving forward and the blade just touching the ground surface. When cleaning up fly rock, you can use a faster speed than for most dozing operation.
 - b. In the shovel working area push the fly rock into the working face.
 - c. On the haul roads push the fly rock over the side of the road.
 - d. You can also use fly rock to fill and level holes in the working area in front or behind the blast area.

OBJECTIVE 6-13

The dozer operator will demonstrate how to prepare a site for drilling.

KEYPOINTS/PROCEDURES

1. The preparation of a drill site is a basic dozing operation. The area to be prepared is usually flat having previously been a bench. The majority of the time drill site areas only require a clean up of backbreak left on the bench and in some cases a small amount of flyrock from previous blasts.
2. Procedure prior to preparing a drilling site
 - a. The dozer operator should talk with the supervisor to gather all the necessary information with respect to:
 - How large an area to clean.
 - Which direction to push the material.
3. Procedures to prepare a drilling site
 - a. With the dozer moving forward and the blade just touching the ground, push the material into the previously blasted area.
 - b. It may be necessary to build terraces for the drill to work on. Use a basic side hill cut (OBJECTIVE 6-10) for pushing these terraces.
 - c. For the terrace use solid material strong enough to support the weight of the drill.
 - d. Build the terraces with the slope toward the inside of the cut.
 - e. Make the terrace wide enough to allow the drill to maneuver without any difficulty.
 - f. See OBJECTIVE 9-5 regarding pushing off the overhang at the working face.

OBJECTIVE 6-14

The dozer operator will demonstrate the proper techniques for rebuilding a dump and constructing a safety berm.

KEYPOINTS/PROCEDURES

1. Procedures prior to rebuilding a dump and constructing a safety berm.
 - a. The dozer operator must first inspect the general condition of the dump, taking particular notice of any cracks, sagging, or moving.
 - b. Determine how far back from the edge the dump is stable. If in doubt, contact the supervisor for a decision on what point the dump should be rebuilt from.
 - c. Choose suitable material to rebuild the dump and have a row of loads dumped across the width of the dump at the rebuild points.
2. Procedures to rebuild a dump and construct a safety berm
 - a. Levelling loads is a basic dozing procedure. Start from the right side of the dump and work to the left whenever possible. It is important that the dozer work in full view of trucks that are dumping.
 - b. Continue dumping loads and spreading them until near the edge of the dump. Remember, a slight incline from the inside of the dump to the outside should be maintained. It is always better for trucks to back up a hill to the edge of any dump.
 - c. On the last row of loads on the outside edge of the dump, construct the safety berm. The safety berm should be at least three feet in height and be thick enough to hold any haulage truck from going over the dump. Also, the material used should be stable, not snow or mud.
 - d. Taper the safety berm towards the top by lifting the blade and moving slowly forward. The excess material is pushed over the dump all in the same motion.

Caution:

Constructing a safe berm is very important. An unsafe berm could mean the life of a truck operator.

OBJECTIVE 6-15

The dozer operator will demonstrate proper road building procedures.

KEYPOINTS/PROCEDURES

1. The haul roads must be constructed so that they are capable of carrying heavily loaded trucks at a designated speed.
2. Haul roads built within the pit are usually pushed the length of the bench.
3. Road building procedures
 - a. The basic dozing procedure of spreading material (OBJECTIVE 6-4) is applied when building roads.
 - b. Loads will likely have to be brought in to fill small holes and hollows. Since the road should be built of fine material, the dozer operator must weed out any coarse material and move it to one side.
 - c. Watch for overhead cables across roadways. When trucks are dumping, make sure the boxes are down before the trucks drive away.
 - d. Crown roads at the centre.
 - e. Once the road is constructed, the final procedure is to ditch on both sides.
 - f. To build roads across mountainsides use the sidehill cutting method (OBJECTIVE 6-10). The important point when building mountain roads is that the material you push over the edge must be stable enough to hold heavy duty haulage trucks.

OBJECTIVE 6-16

The dozer operator will demonstrate the proper techniques for repairing roads.

KEY POINTS/PROCEDURES

1. Procedures for repairing soft spots

A soft spot is an area on the road that through constant use has been punched out to form a pot hole. To repair a soft spot:

- a. Take out all the soft material and ask the supervisor for as many loads of good material as it takes to fill the dug out area.
- b. Have the load dumped on the edge of the dug out area. Spread this material bringing the road back to an acceptable standard. Weed out coarse material and push it to one side.
- c. Repair small dips in the road's contour by having material brought in and dumped on the edge of the dip, and then levelling it.

2. Procedures for removing sharp, protruding rocks

Another problem when maintaining roads is sharp rocks protruding above the road surface. Remove these rocks because they are a tire hazard:

- a. Dislodge stubborn rocks with a ripper and then push the loose material to the side.
 - b. Fill the hole with extra material and level it off.
3. There is always a problem of water ditches backfilling with material and consequently causing road damage. The dozer operator must re-ditch these areas in order to maintain the road.
4. A dozer is also used to spread gravel when resurfacing roads.

OBJECTIVE 6-17

The dozer operator will demonstrate the proper procedures for moving cable stands and boats.

KEYPOINTS/PROCEDURES

1. Procedures to move cable stands
 - a. Make sure that all personnel are away from the cable stand, and use extreme caution when moving the stand.
 - b. When moving cable stands with a dozer, always push against the base, which in the majority of mines is a rubber tire filled with concrete. (Do not rest the blade on top of the base and push against the steel pipe that holds the pole.)
 - c. Never bang the base to get it moving; push the standard at a slow and even speed.
2. Procedures to move cable boats
 - a. Cable boats are dragged behind the dozer, not pushed.
 - b. Use a ground man whenever possible.
 - c. When hooking up the boat to the dozer, make sure it is securely fastened.
 - d. Move at a slow and even speed.

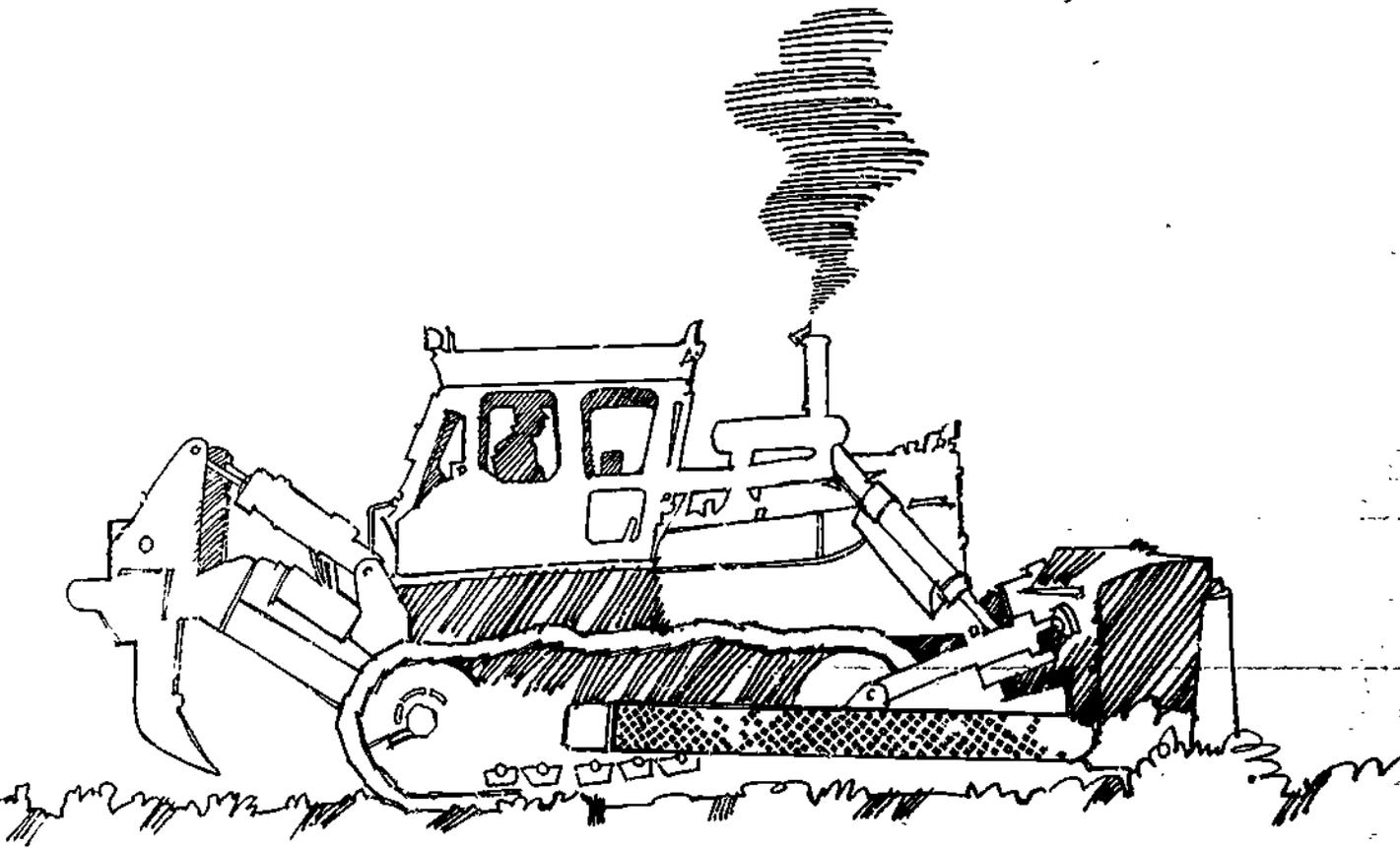
Cautions:

Cable boats swing from side to side when being pulled: use extreme caution when working around a moving boat.

Follow safety clearance standards when moving stands and boats under overhead power lines and power cables.

SERVICE AND REFUEL

module 7



OBJECTIVE 7-1

The dozer operator will demonstrate entering the lube and oil house area safely and explain all precautions to be taken in the area.

KEYPOINTS/PROCEDURES

1. When entering the lube and oil house area, the dozer operator must put the transmission into first gear. Keep the dozer travelling at low speed. Use extreme caution when in this area because other pieces of equipment and employees will be moving around. The key to safety in the lube and oil house area is to travel at low speed.
2. When the dozer is being serviced, the dozer operator must climb to the ground. Before leaving the cab, the operator should:
 - a. Shut down the engine.
 - b. Place the transmission in neutral
 - c. Engage the transmission in neutral.
 - d. Lock the brakes on.
 - e. Lower the blade and ripper assemblies to the ground.

Caution:

Use the provided handrails when climbing down from a dozer. Never jump off a dozer.

OBJECTIVE 7-2

The dozer operator will demonstrate all procedures for having the dozer refuelled by a fuel truck and will explain all precautions to take.

KEYPOINTS/PROCEDURES

1. If the company allows the dozer to approach a fuel truck, use extreme caution. Come alongside the fuel truck at a very low speed, keeping the truck in full view at all times.
2. Once the fuel truck driver has spotted the dozer, the dozer operator should:
 - a. Shut down the engine, if directed.
 - b. Place the transmission in neutral.
 - c. Engage the transmission lock.
 - d. Lock the brakes on.
 - e. Lower the blade and ripper assemblies to the ground.
3. The dozer operator must get out of the cab and stay on the ground during refuelling.
4. While being serviced in the pit, the dozer operator must be aware of other pieces of equipment and personnel that may be around the dozer.
5. After the refuelling and servicing is completed, before starting up and going back to work, the dozer operator must walk around the dozer to make sure that no one is in close quarters to the machine.

OBJECTIVE 7-3

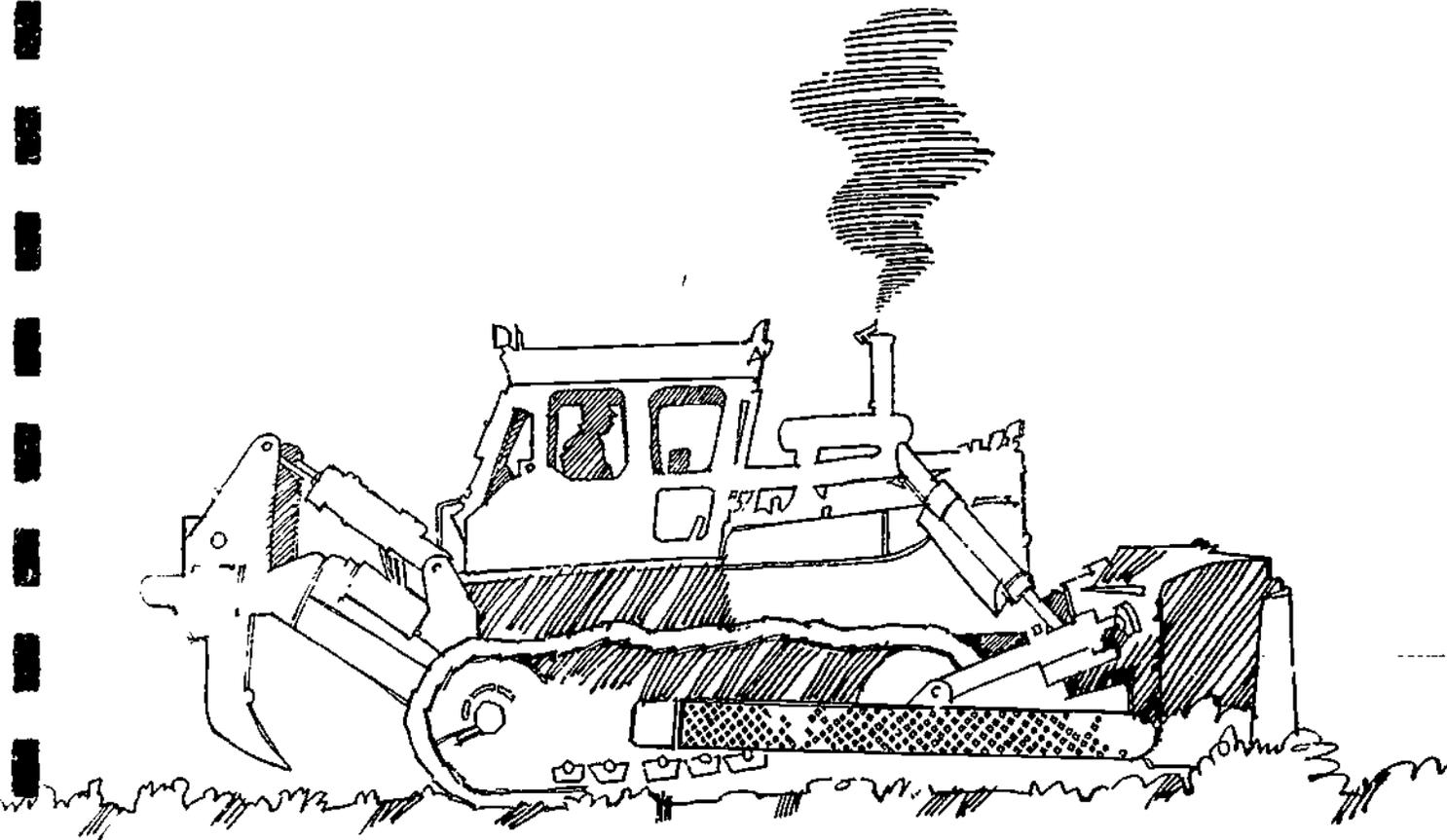
The dozer operator will demonstrate good housekeeping on the dozer and in the fuel and service areas inside and outside of the pit.

KEYPOINTS/PROCEDURES

1. Whenever possible the dozer operator should clean up the service area while the dozer is being serviced:
 - a. Pick up oily rags, paper, etc. and put them into a barrel for disposal. Continually clean up old rags, and paper because the refuel site usually changes daily in accordance with the pit situation.
 - b. Clean up oil spills on the floor as soon as possible. Eliminate all possible hazards that may cause slips and falls.
2. Good housekeeping in the pit is just as important as in the service areas.

EXPLORATION WORK

module 8



OBJECTIVE 8-1

The dozer operator will demonstrate proper road building procedures during exploration work.

KEYPOINTS/PROCEDURES

1. During all exploration work, which takes in such functions as road building, land clearing, drill site preparation, trenching and adit site preparation, a strong emphasis should be placed upon environmental protection. The minimum amount of land disturbance is important to lessen the environmental impact of the operation.
2. The majority of times road building for exploration work is done in mountainous terrain. Mountainous terrain requires the use of the side cutting method (OBJECTIVE 6-10) to build roads.
3. An important point to remember in road building is adequate drainage. Drainage is accomplished by using the ditching technique (OBJECTIVE 6-7).
4. There may be instances where the exploration road may have to cross a small creek or stream. Remember, minimum disturbance is important. For exploration roads that may only be temporary, proper culverts may not be practical and in this case culverts constructed of logs may be used. However, use steel culverts whenever possible.

OBJECTIVE 8-2

The dozer operator will demonstrate the proper techniques for land clearing.

KEYPOINTS/PROCEOURES

1. Land clearing is a procedure used in the primary preparation of drill sites, adit sites and the actual clearing for the open pit.
2. The dozer is the standard piece of equipment used in land clearing and is equipped specifically for this type of work. The dozer is used to push brush and small trees into piles.
3. **Brush clearing**
 - a. The pushing procedure applied for brush clearing is a basin dozing procedure (OBJECTIVE 6-1).
 - b. Lower the blade until it makes light contact with the ground and move forward. The blade will uproot or break off small trees or brush during the push.
 - c. Lift the blade when the brush is free to loosen the earth from the roots. The less earth mixed with the brush the better for burning.
4. **Removing large brush or medium size trees**
 - a. Contact the tree about twelve inches above ground.
 - b. Move forward while raising the blade.
5. **Removing large trees**
 - a. Lower the blade and cut the roots on the side opposite the direction you wish the tree to fall.
 - b. Cut the roots on both sides parallel to the direction of fall.
 - c. Slowly contact the tree about five or six feet up the trunk. You may have to build a small ramp with surrounding material to gain higher contact on the tree.
 - d. Push in the direction you wish the tree to fall.
 - e. Once the tree starts to fall, back the dozer away immediately. Be very cautious of trees that could spring back towards the dozer.

Caution:

Inspect large trees for dry rot, dead limbs, and the direction of lean before attempting to remove them. Remove any dead limbs before contacting the tree.

OBJECTIVE 8-3

The dozer operator will demonstrate the proper procedure for constructing water bars on an exploration road.

KEYPOINTS/PROCEDURES

1. On an exploration road where ditching is impossible, water bars may be the alternative. Water bars are small ditches that are made diagonally across the surface of the road.
2. The rain or spring run off, which is the main cause of wearing and erosion on the road surface, can be diverted by the use of water bars. Surface water on the road flows into the water bars to the outside edge of the road where it drains away.
3. **Constructing water bars**
 - a. Make the water bars with the corner bit of the dozer blade.
 - b. On a dozer that has a tilt blade, tilt the blade towards the desired side.
 - c. Put the corner bit into the road surface and push a small ditch approximately four to six inches in depth diagonally across the road. Push from the inside edge to the outside edge.

OBJECTIVE 8-4

The dozer operator will demonstrate proper drill site preparation techniques.

KEYPOINTS/PROCEDURES

1. In all exploration work a certain amount of drilling takes place. Drilling requires adequate drill site preparation and the dozer is the primary piece of equipment used for this work.
2. The material for the site should be suitable to support the weight of the drilling machine. Do not make drill sites out of soft material that will not support the machine.
3. Once the location of the drill site is chosen remove any small brush or trees, then level the area. The majority of the time the drill sites are located in mountainous terrain making it necessary for the dozer operator to use bench or side hill cuts (OBJECTIVE 6-10).
4. If the drill site is located on relatively flat ground, the operation simply requires a basic levelling (OBJECTIVE 6-1).

OBJECTIVE 8-5

The dozer operator will demonstrate proper adit site preparation techniques.

KEYPOINTS/PROCEDURES

1. Adit site preparation involves the same techniques as drill site preparation, i.e., bench or side hill cuts.
2. A factor particular to adit site preparation is the unsafe material immediately above the adit opening. The dozer must remove this excess material before the actual adit work can begin. As the adit site preparation is progressing the operator should remove any potentially unsafe material. This precaution of pulling down excess material during site preparation ensures there will be no unsafe material overhead once adit work commences.

OBJECTIVE 8-6

The dozer operator will demonstrate the proper procedures for trenching.

KEYPOINTS/PROCEDURES

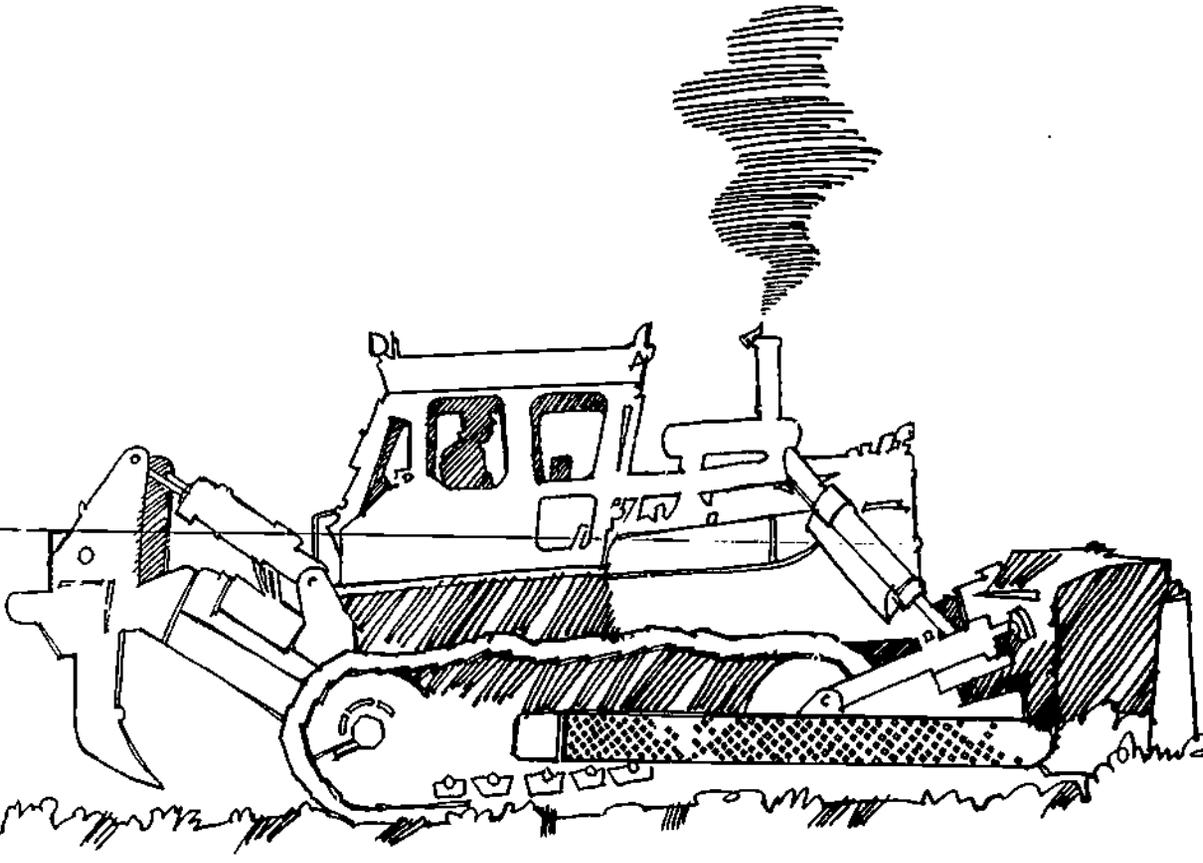
1. Trenching is used for intensive exploration of surface outcrops. The use of the dozer disturbs large areas, but it is still the quickest and most economical method of trenching.
2. Trenching procedures

Trenching involves making a slot cut. The key to trenching is to keep the trench wider than the dozer blade in order to avoid the blade getting jammed tightly into the cut:

 - a. Start the trench from a level area. Level if necessary.
 - b. Once the trench is formed, complete a basic forward push. The walls of the trench will hold the material on the blade allowing the dozer to move a greater amount of material than under normal pushing conditions.
 - c. Use extreme caution once the walls of the trench exceed the height of the dozer. If the walls are not stable, take down any material that poses a threat to either yourself or the dozer.

SPECIAL ASSIGNMENTS

module 9



OBJECTIVE 9-1

The dozer operator will demonstrate the proper procedures for towing a drill with a dozer.

KEYPOINTS/PROCEDURES

1. The towing of drills can be accomplished by two different methods. The preferred or recommended method is with a tow bar. The other method is with cable slings.
2. Towing with a tow bar.

To tow a drill a long distance with a tow bar, take the following steps:

- a. Make sure the drill is initially parked on flat ground.
 - b. Lower the drill mast.
 - c. Shut off the power and disconnect the power cable.
 - d. Disconnect the propel chains.
 - e. Release the propel brakes.
 - f. Hook up the tow bar to the drill, then to the dozer.
 - g. Secure the safety lines.
3. Towing with cable slings

Towing a drill with cable slings is not recommended but can be used for short distance moves or for moves over flat ground. Make sure that the cable slings are adequate to handle the load.

Caution:

Use extreme caution when towing any equipment. For towing drills down an incline it is recommended that another dozer be used in the back of the drill as an anchor to hold the drill back.

OBJECTIVE 9-2

The dozer operator will demonstrate the proper procedures for a coal cleanup.

KEYPOINTS/PROCEDURES

1. The final cleaning of the overburden remaining on the coal seam is very important. If this cleanup is done carelessly, it could prove very costly to the company. The final cleaning of the overburden off the coal seam is performed by dozers. If the cleanup was done with shovels, there would be too much coal lost.
2. As much rock as possible is removed from the seam area by the shovel. Then dozers push the remaining rock off the coal. Since coal seams are on a pitch, the overburden is usually pushed down into piles where it can be taken out by loaders or shovels. The overburden is loaded into trucks and hauled to waste dumps. Standard dozing and digging procedures (OBJECTIVE 6-1) are applied in this operation.
3. The key to efficient coal cleanup is to disturb the least amount of coal possible, thereby leaving more coal for recovery during production.
4. Cleanup procedures
 - a. Make the push with the blade slightly touching the coal. The least amount of coal moved while pushing the rock will result in minimal coal wasted. If the pitch is too great and the dozer cannot back up the seam of coal, use an alternative method of dozing.
 - b. Push the overburden diagonally across the pitch of the seam using the standard dozing procedures. While pushing, a large windrow stabilizes the dozer and also keeps material on the blade once the push starts.
 - c. Dozing across a pitch, like across a hillside, is more difficult than straight up and down dozing; it requires extreme caution.

OBJECTIVE 9-3

The dozer operator will demonstrate the proper procedures for pushing coal into a pile for loading.

KEYPOINTS/PROCEDURES

1. The pushing of coal into piles for the purpose of loading into trucks by loaders or shovels is very important.
2. **Ash content in coal**

The seams of coal vary from foot to foot in ash content. For example, within ten feet in the same coal seam the ash content can vary from high to low. The lower the ash content, the better the coal. It is very important when pushing coal with a dozer to ensure the coal is mixed in order to come up with coal that has uniform ash content.
3. **Piling coal**
 - a. Push the coal diagonally down the seam using basic dozing procedures (OBJECTIVE 6-1).
 - b. Keep the pushes as short as possible; this will make them steeper. Long pushes pulverize the coal creating a problem when the coal is cleaned in the preparation plant. Keep the pushes short and minimize running over the coal with the dozer.
 - c. Identify bands of clay or rock splits going through coal seams so that they can be excavated out. These materials raise the ash content in coal.
 - d. The coal next to the bottom of the seam or hanging wall is very soft and is easily pushed out with rock picked-up off the hanging wall. Keep this in mind when working next to the hanging wall.

OBJECTIVE 9-4

The dozer operator will demonstrate the proper procedures for building dams.

KEYPOINTS/PROCEDURES

1. The application of a dozer in dam building is common practice. Use basic dozing and digging techniques (OBJECTIVE 6-1).
2. Material for the dam is usually hauled to the dam site, then spread by the dozer. Depending on the size of the dam, the dozer may have to transport the material to the dam site.
3. It is important that a fill suitable for dams is used. Dam fill should resist water penetration; it should not slough when wet.
4. While the fill is being hauled in and dumped, either on top of the dam site or over the edge, the dozer operator may have to spot the trucks:
 - The dozer operator should use extreme caution when backing trucks up towards an edge.
 - It may be necessary for the trucks to dump on top and the dozer operator to push the material where it is needed.

OBJECTIVE 9-5

The dozer operator will demonstrate the proper procedures for pushing off overhangs at the working face.

KEYPOINTS/PROCEDURES

1. Overhangs at the top of the working face are a common problem in surface mining. The overhangs become a danger to both equipment and personnel if not taken down. The majority of overhangs are brought down with shovels, but where there is a possibility of danger to personnel or machines, overhangs are pushed down with a dozer.
2. Pushing off overhangs at the working face
 - a. To gain access to the overhang the dozer operator may have to push a rough road for the dozer to travel on. You will have to push the road through a blasted area, so there will be some tough going for the dozer.
 - b. Make a visual check of the area for unsafe conditions.
 - c. Before pushing the overhang down, check to make sure that all equipment and personnel are moved to a safe area.
 - d. Start the push from one side or the other of the overhang. This will ensure that the dozer does not travel out onto the overhang. Never operate on the overhang itself. Push at a 90 degree angle to the top of the working face.

Caution:

Use extreme caution when pushing material over the edge of a high working face because the material has been blasted and is no longer stable. When pushing on the overhang, always keep in mind that with only one push the entire overhang may fall. Therefore, operate defensively at all times.

OBJECTIVE 9-6

The dozer operator will demonstrate the proper procedures for cleaning catch berms.

KEYPOINTS/PROCEDURES

1. When an open pit is worked in benches, it is required by legislation that a berm 25 feet wide be left so that it can catch material falling from one cut-wall of a bench to the next. It may be necessary periodically to clean these catch berms.
2. **Cleaning catch berms**
 - a. Remember, there should never be equipment or personnel working directly below where you are pushing material. All equipment and personnel should be cleared from the area before the cleaning operation commences.
 - b. Start at the top catch berm and push the loose material down to the next lower berm.
 - c. Work the material from the inside of the catch berm to the outside edge and over. This technique is similar to the sidehill cut, the only difference being that the travel way has already been established.

Caution:

The stability of the catch berm may change as the cut wall erodes and becomes weaker. Since you may have to side cast material with the blade, use extreme caution when working near the edge of a catch berm.

OBJECTIVES 9-7

The dozer operator will demonstrate the proper procedures for scaling.

KEYPOINTS/PROCEDURES

1. In open pit mining it may be necessary on occasion to scale the cut wall. The scaling is done by dragging an old dozer track or chains across the face of the cut wall. The old dozer track is hooked to the dozer by slings or chains and then lowered over the edge of the catch berm. As the dozer travels forward the old dozer track is dragged across the cut wall face knocking down any loose rocks that may be hanging on the face.
2. **Scaling procedures**
 - a. For mines worked in benches, clean off the catch berms before beginning scaling. This gives the dozer a safe place to travel.
 - b. Once you have scaled one cut wall face, move down to the next catch berm, clean it off and scale it. Continue until all the berms are cleaned and the faces are scaled where necessary.

Caution:

It is most important that all equipment and personnel are cleared from the area before cleaning berms and scaling commences.

OBJECTIVE 9-8

The dozer operator will demonstrate the proper procedure for winching and towing.

KEYPOINTS/PROCEDURES

1. During the normal operation of a mine, equipment occasionally gets bogged down and requires assistance to get free. Two main methods are used to get the equipment mobile again. One method is by winching and the other is by towing.

2. **Towing or pulling out**

Equipment that is bogged down may be pulled out with the aid of a dozer.

- a. Attach a tow line to the draw bar or the front hook of the dozer.
- b. Pull the bogged equipment either forward or backward, but whichever direction you choose, it is important that you pull straight.
- c. Make use of the power on the bogged down equipment to aid in the pull whenever possible.

Caution:

Never let anyone come between the pulling dozer and the bogged down equipment. If the tow line should break, a person within the area between the two pieces of equipment could suffer serious injury.

3. **Winching**

Dozers equipped with winches are more versatile for winching than dozers without winches. Dozers with winches can tow and pull as well as use winching power. The winch provides a pull greater than towing or pulling alone can give.

When winching out bogged down equipment:

- a. Pull in a straight line.
- b. Use the lowest speed on the winch, remembering that winch speed is related to engine speed.
- c. If the dozer starts to slide across the ground while winching, you may have to anchor the dozer down. If you find that the anchor leaves the dozer not in a straight line but rather at an angle, a pulley can be chained to another anchor and the winch line fed through the pulley. This will give the straight pull that is necessary.

Caution:

Make sure that all personnel are at least the length of the winch cable away when winching, because serious injury can result from a cable breaking. Also make sure that screens are in place when winching.

OBJECTIVE 9-9

The dozer operator will demonstrate the proper procedures for changing or repositioning ripper shanks.

KEYPOINTS/PROCEDURES

1. When changing or repositioning ripper shanks, you may have to move the dozer forward, backward or swing it sideways to align the shank slot with the shank.
2. Changing or repositioning ripper shanks
 - a. Sink the ripper shank 1/2 to 2/3 into the ground.
 - b. Drive out the keeper pin on the side of the shank main pin.
 - c. Adjust the ripper slightly with the hydraulics to loosen the main pin which can then be easily removed.
 - d. Remove the main pin.
 - e. Raise the ripper over the top of the shank and move the dozer forward.
 - f. Reposition the dozer and back it up, lining up the desired ripper shank slot.
 - g. Lower the ripper onto the shank.
 - h. Replace the main pin and keeper pin.



OPEN-PIT MINING JOB TRACK DOZER SKILL PROFILE

BASIC SAFETY AND OPERATING RULES	EXPLAIN THE IMPORTANCE OF SAFETY AND OPERATING RULES	EXPLAIN THE IMPORTANCE OF STAYING ALERT TO CHANGING CONDITIONS	EXPLAIN THE COMPANY TRAFFIC CONTROL SCHEME	EXPLAIN HOW TO AVOID TIRE DAMAGE	EXPLAIN NORMAL AND EMERGENCY BRAKING TECHNIQUES	THE HO
	EXPLAIN THE COMPANY'S LOCK-OUT PROCEDURES					
COMMUNICATIONS	SEND AND RECEIVE SIGNALS	FILL OUT REPORT FORMS	OPERATE THE MOBILE RADIO	READ SURVEY STAKES		
GAUGES AND CONTROLS	LOCATE AND IDENTIFY GAUGES AND CONTROLS	DESCRIBE THE FUNCTION AND RANGE OF GAUGES	DESCRIBE THE FUNCTION OF CONTROLS	DESCRIBE WARNING SIGNALS AND EXPLAIN THE ACTION TO BE TAKEN		
PRE-START AND OPERATIONAL CHECKS	LOCATE AND IDENTIFY THE BASIC UNITS OF A DOZER AND THE COMPONENTS OF THE UNITS	LOCATE IN SEQUENCE THE PRE-START AND OPERATIONAL CHECK POINTS	PERFORM ALL PRE START CHECKS	PERFORM ENGINE START UP AND SHUT DOWN PROCEDURES	PERFORM OPERATIONAL CHECKS	WEA
BASIC DOZER OPERATION	MOVE THE DOZER FORWARD	REVERSE THE DOZER	STEER THE DOZER	OPERATE ON A DOWNGRADE	STOP AND PARK THE DOZER	
DOZER PRODUCTION OPERATION	PERFORM DOZING AND DIGGING	DEMONSTRATE RIPPING TECHNIQUES	LEVEL PILES	SPREAD MATERIAL	PUSH MATERIAL	
	PREPARE A DRILL SITE	REBUILD A DUMP AND CONSTRUCT A SAFETY BERM	BUILD ROADS	REPAIR ROADS	MOVE CABLE STANDS AND BOATS	
SERVICE AND REFUEL	ENTER THE LUBE AND OIL HOUSE AREA	REFUEL THE DOZER	PRACTISE GOOD HOUSEKEEPING			
EXPLORATION WORK	BUILD ROADS	CLEAR LAND	CONSTRUCT WATER BARS	PREPARE A DRILL SITE	PREPARE AN ADIT SITE	
SPECIAL ASSIGNMENTS	TOW DRILLS	PERFORM A COAL CLEANUP	PUSH COAL FOR LOADING	BUILD DAMS	PUSH OFF THE OVERHANG AT THE WORKING FACE	

JOB TRAINING SERIES

ZER OPERATOR

OFFICE CHART

Developed By:
 Research and Curriculum Development
 Post-Secondary Department
 Ministry of Education
 1982

EXPLAIN THE IMPORTANCE OF GOOD HOUSEKEEPING	EXPLAIN THE COMPANY BLASTING AND GUARDING PROCEDURES	DESCRIBE THE BASIC LAYOUT OF THE PIT AREA	EXPLAIN THE USE OF FIRE SUPPRESSION SYSTEMS AND FIRE EXTINGUISHERS	DESCRIBE MISS HOLES AND MISS HOLE REPORTING PROCEDURES	EXPLAIN THE IMPORTANCE OF REPORTING ACCIDENTS AND INJURIES	EXPLAIN THE COMPANY'S POWER CABLE HANDLING POLICY
DESCRIBE A COLD WEATHER START						
PILE MATERIAL	DEMONSTRATE DITCHING TECHNIQUES	BUILD RAMPS	MOVE LARGE BOULDERS OR ROCKS	DEVELOP SIDHILL CUTS	CLEAN THE SHOVEL AREA	CLEAN UP FLYROCK AFTER A BLAST
PERFORM TRENCHING PROCEDURES						
CLEAN CATCH BERMS IN THE PIT	PERFORM SCALING	WINCH AND TOW	CHANGE RIPPER SHANKS			

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.

FOR FURTHER INFORMATION

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