THE DOZER BOSS

Who is the dozer boss (DOZB) and just what does he do? The DOZB is an ICS position who is usually supervised directly by a DIVS or STLD in the nationally recognized operations chain of command. He is the manager of an agency contract for one or more dozers, with operator, transport, and assigned personnel. He may manage agency assigned equipment/personnel independently or in addition to private contractors.

Assignments may be for initial attack fire suppression (usually a "District" resource order) or for extended attack (ordered by Incident Command Team). BAER teams also regularly need equipment and DOZB. Other resource orders may be made for ice storm, wind storm, insect disease projects, and other risk incidents where the scale of operations exceeds local capacities to handle.

The use of dozers and heavy equipment has three overwhelming **advantages** to hand labor:

1. Equipment generally can do the same job **faster.**
2. Equipment generally can do the same job **cheaper.**
3. Equipment **eliminates safety risks** to people by reducing the number of people on site.

The old adage "a machine can do the work of a hundred men" is truer than ever. But it is critical to have **the right machine, in the right place, with the right operator.** You as a dozer boss can size up this combination and ensure the **right job** gets done. Capable operation and supervision is essential to avoiding and mitigating specific hazards associated with the use of machinery.

This **S-232** course is designed within a timeframe to give you the best training available to assume a new responsibility important and respected in ICS. Your performance will determine whether this position earns more or less in the future. Accomplishing incident objectives, your own performance evaluation, and the image of your peer group depends on **individual commitment** to strive for excellence. Do not be overwhelmed with this challenge, but grow with it. **Ask** questions and gain from the knowledge of others.

The difference between a DOZB and tractor plow boss (TRPB) may be nil depending on local factors and needs, but in theory, here is a comparison:

DOZB	TRPB
Tracked dozer	Tracked dozer with rear plow attachment
Usually larger than JD450, D7 common	Can be small as JD350, JD550 common
Private contractor more common	Agency equipment and operator more common
DOZB may not be an operator	TRPB must be operator qualified
Operator experience usually low in fire and wildland environment	Operator experience usually good in fire and home unit wildland environment
Mostly western U.S.	Mostly eastern U.S.
Mostly extended attack, indirect	Mostly initial attack, direct
May be assigned Alternative Industrial Machinery (skidders, skidgines, track hoes, feller bunchers, processors, chippers, etc.)	

Both positions should be filled by people who have experienced backgrounds in various wildland fuels and fires. They should have experience working with increasing organizational complexity including handcrews, air operations, and equipment. Others may get most of their experience through timber sales operations by developing advantageous skills in utilizing equipment under results oriented workloads.

DOZB should have good interpersonal skills just as CRWB has to control and motivate those he is in charge of to accomplish work safely, satisfactorily, and agreeably. The DOZB also works with CRWB, HEL attack, and other DOZB.

The DOZB sizes up the work he is assigned to going on around him. This is a daily necessity and is usually accomplished at pre-op or post-op briefings. Machinery has its own safety hazards which the DOZB must be aware of in addition to everything else.

Candidates who wish to take S-232 or develop the skills to be a DOZB, usually need to have a minimum of five years experience, some operation experience, and awareness of (or an interest in) getting jobs done with machines. Although neither a DOZB nor operator is usually a mechanic, some knowledge of maintenance and field repair is very valuable.

Efficient accomplishment of the job also depends on cooperation of the DOZB with operators, understanding operator's abilities, and comfort level. A machine, even at maximum performance and matched to the optimum situation, may still fail to produce expected results. Perhaps the expectations are unreasonable, work conditions have changed with time/distance, or are limited by operator skill. Do not expect the operator to produce results that far exceed his skill as safety may be compromised or equipment may be damaged.

At this point, do you have an understanding of who the DOZB is and what he does? Now that your motor is warmed up to operating temperature, let's turn up the RPM's.

Dozers

Dozers are specially designed, heavy construction equipment that has been adapted to wildland firefighting applications. Recent federal safety laws have seen development in dozer rollover protection (ROPS), fire curtains, and lighting equipment. Advanced radio communication devices that enable the operator to talk hands-free are also being used. Still, with all these advances, the dozer operator has a risk level approaching that of an air tanker pilot.

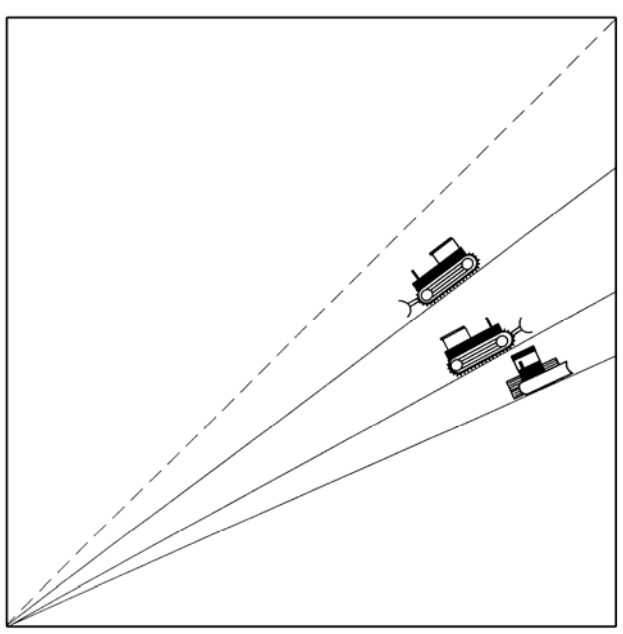
Dozers vary in size from the small Type 3 dozers to the large Type 1 dozers. Light dozers (Type 3) are effective in building fireline in light fuels on level to moderate terrain. They perform best in soil with few rocks, and in wet soil conditions, especially when equipped with wide tracks. They're maneuverable in close quarters and generally do less damage to the environment. They also can be very useful in mopup operations.

Medium-sized dozers (Type 2) are generally the best all-around size for fireline construction as they are maneuverable and perform well on moderately steep slopes. They will handle the average fuel and terrain conditions in the mountainous areas and when fitted with wide tracks perform well in wet soil conditions.

Heavy dozers (Type 1) are generally too big for many fireline construction situations. They are hard to maneuver in close quarters, especially in steep terrain. They are best assigned as lead dozers to pioneer in heavy fuels on level to moderate terrain. Pioneering is when a dozer clears an area ahead of a crew. Heavy dozers will have difficulty in wet ground unless fitted with extra wide tracks. On standard tracks their bulk weight more that offsets the hold up surface of the tracks, and once these large machines are stuck, it is a major job to free them.

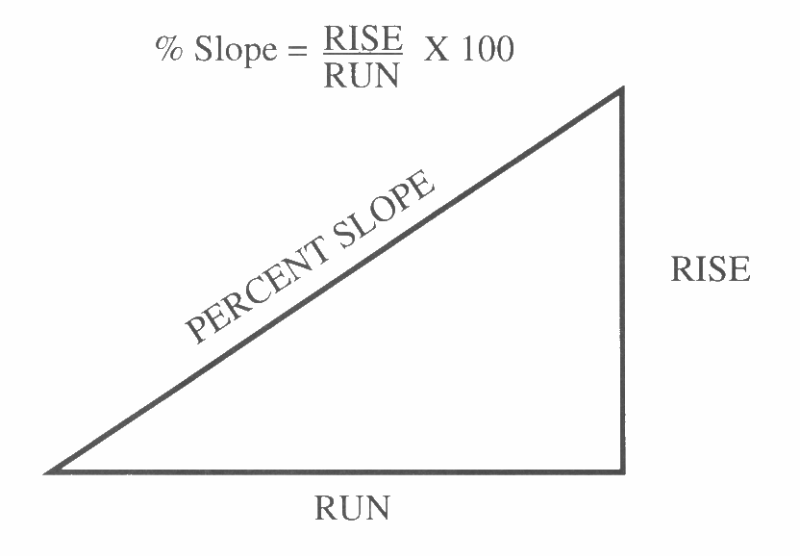
As with any piece of specialized equipment, the dozer has limitations. As a general guideline, dozers should not be operated across slopes (sidehill) greater than 45 percent, uphill slopes greater than 55 percent, or downhill on slopes greater than 75 percent (see Figure 1).

Figure 1 – Guideline for Maximum Percent Slope Dozer Operation



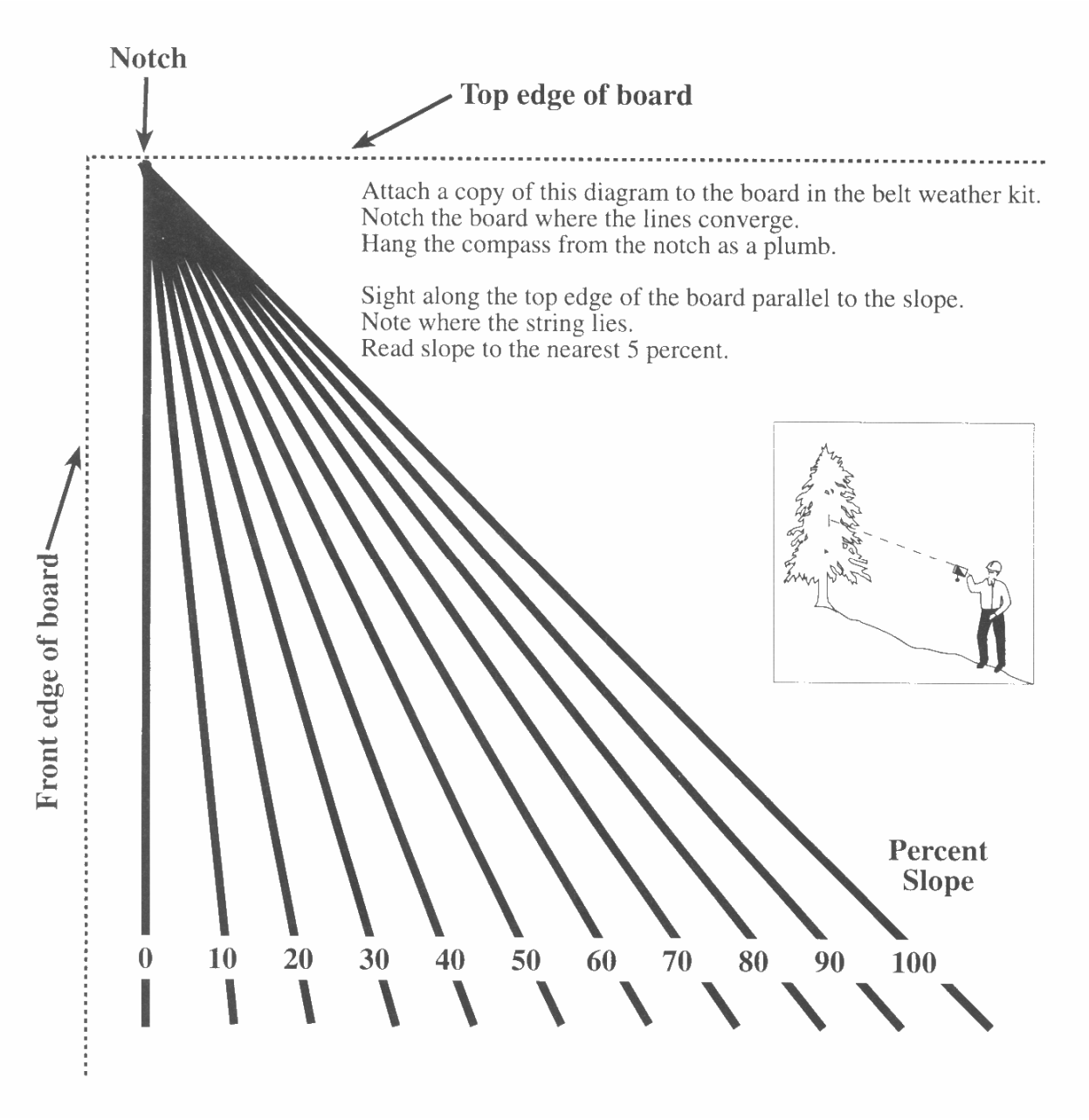
Percent slope is determined by the vertical distance (rise) divided by horizontal distance (run) multiplied by 100 (see Figure 2).

Figure 2 – Calculation of Percent (%) Slope



An easy method to determine percent slope is with the use of a slope meter (see Figure 3).

Figure 3 – Slope Meter



Clinometers or abney levels are instruments that can be used to measure percent slope. To use the clinometer, hold it to your eye and with both eyes open, look simultaneously through the lens and alongside the housing. A horizontal sighting line will appear. Raise or lower the clinometer (by tilting your head) to place the sighting line at the top or bottom of the object. Read the percent slope number closest to the sighting line.

Operate the abney level similarly to the clinometer, but rotate the outside scale forward or backward to align the bubble inside the instrument rather than tilting your head. Read the number from the outside percent slope scale.

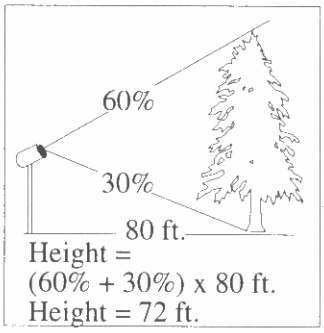
Clinometers and Topographic Abney Levels can be used to measure slope, height of objects, and vertical angles (see Figure 4).

Figure 4 – Measurements with Clinometer or Abney Level

Measurements

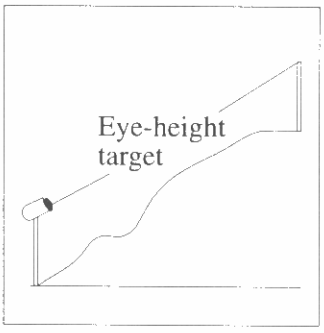
Height

For height measurement, choose a scale and a convenient baseline distance. Standing at the baseline distance, sight the tip of the object and read the scale; sight the bottom of the object and read the scale. Add the two scale readings together and multiply this total reading by the baseline distance. This is the object's height.



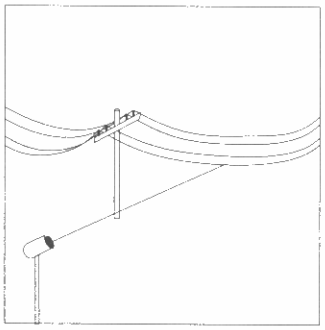
Slope

Sight upslope or downslope on the object at eye level. Read directly from the percent or degree scale.



Vertical Angles

Sight upslope or downslope on the object at eye level. Read directly from the degree scale.



Production rates of line construction (single-pass) vary, but a Type 2 dozer can construct about 2,500 feet of line in grass, 1,100 feet of line in medium brush, and 900 feet in heavy brush per hour. These figures are averages, figuring upslope run does not exceed 40%. In level situations, that same Type 2 dozer can construct 4,000 feet of single pass line in grass, 3,300 feet in medium brush, and 1,900 feet in heavy brush, per hour.

Table 1 – Single Pass Line Construction
40% Slope*
12-14 foot Blade Widths

	Grass	**Medium Brush**	**Heavy Brush**
Type 2	2,300 feet	1,000 feet	700 feet
Type 1	3,000 feet	1,500 feet	1,100 feet

***** 40% slope is average for most wildland fire areas.

(To compare with a Type 1 handcrew, see the Fireline Handbook)

Table 2 provides single pass line construction rates in chains per hour for several variables. The table was developed from a series of field tests.

Some generalities that can be concluded from Table 2 are: 1) production rates drop as the fuel loadings increase and 2) slope has an effect on production rates, particularly traveling upgrade, and some dozer sizes are better suited for select jobs than others.

Table 2 – Fireline Production Rates (Single Pass) for Dozers Manufactured Since 1975

Fire behavior fuel model	Slope class 1 (0%-25%)		Slope class 2 (26%-40%)		Slope class 3 (41%-55%)	
	Up	Down	Up	Down	Up	Down
	Chains per Hour					
Small dozers (Type 3)						
1, 2, 3	63	88	36	88	14	16
4	22	29	12	30	3	22
5	63	88	36	88	14	61
6	39	59	22	62	8	42
7	39	52	22	56	8	35
8	63	88	36	88	14	16
9, 11 , 12	22	30	12	30	3	11
Medium dozers (Type 2)						
1, 2, 3	88	118	58	112	35	73
4	32	47	18	53	5	31
5	88	118	58	112	35	73
6	51	75	26	78	9	48
7	51	75	27	78	9	48
8	88	118	58	112	35	73
9, 11, 12	32	47	18	53	5	31
10, 13	17	23	10	25	3	11
Large dozers (Type 1)						
1, 2 3	91	124	62	118	35	83
4	43	60	27	62	12	40
5	91	124	62	118	35	83
6, 7	63	91	41	90	22	57
8	91	124	62	118	35	83
9, 11, 12	43	60	27	62	12	40
10, 13	27	38	15	34	4	16

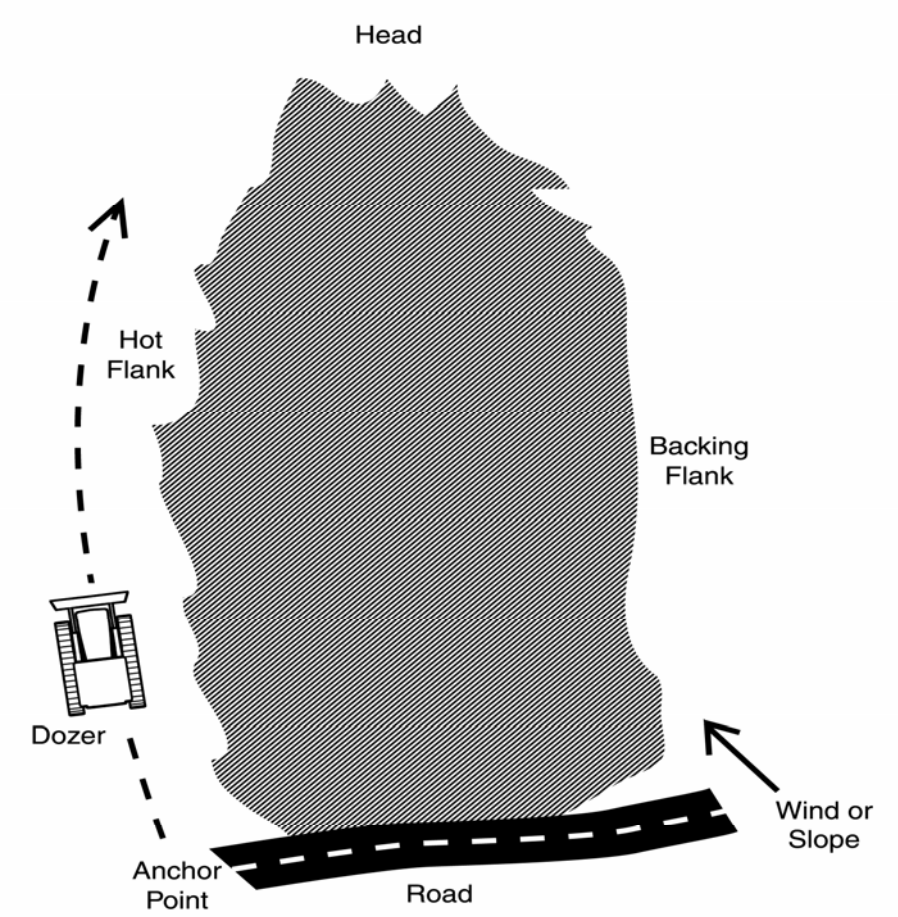
As with any specialized piece of equipment, the machine is only as efficient as the operator. Each operator has varying degrees of skill in operating equipment in a variety of wildland situations. Many areas are very fortunate to have qualified fire operators. These operators know their machines and what they can or cannot do.

When using dozers in the attack plan, brief the operator(s) prior to deploying them. Review the control objectives and what must be accomplished and let them determine where and how they get the job done. The operator will tell the dozer boss if he/she needs help or other assistance. The dozer operator is very busy once the line assignment starts; therefore, frequent interruptions or radio traffic calls can be upsetting.

The deployment of dozers is basically the same as with any ground resource. Work from an anchor point up each flank toward the head (pincer action). Remember, the dozer even with metal cage protection is just as vulnerable to fire as a hand crew person and the same safety rules apply.

Because of their special qualities and ability to put in line quickly, a dozer can be "bumped-up" ahead of ground forces on a flank. Make sure an anchor point has been established. When bumping-up a dozer, make sure the operator knows your intentions. Bumping up a dozer ahead of another dozer is called leap frogging. Many times the operator can "see" the plan and he will bump-up on his own in an indirect method. Coordination is very important; make sure the ground forces tie into the dozer line so the control line is completed.

The dozer operator has an “instinct” of knowing how to get around the head and for working the hot flank. In doing so, he/she needs concentration, lack of radio interruptions, and on occasion air support. Once on the upper end of the hot flank, the dozer’s progress needs to be closely monitored to ensure he/she is safe. Air attack priorities should include supporting dozer work on the hot flank. Dozers should be deployed on the hot flank first, and then as they control the head, they will circle the fire finishing up on the cold flank.



Initial Attack on Hot Flank

To this point, we have only addressed the typical wildland fire with no special problems of fast rate of spread or wind problems. Because of steep topography, poor access, high winds, or high rate of spread it may be necessary for the incident commander or operations section chief to back off to a wide ridgeline and construct a fire break off of that ridge.

Dozer Use

Dozers are effective firefighting tools if they are used correctly. They are costly to operate and require good operators, good supervision, and adequate service and repair. However, in excessively rocky areas and in some dense timber stands, especially with many large trees, their progress will be drastically slowed. When they are needed to pioneer ahead of a tractor/plow or crew, they are indispensable. In this capacity they do the clearing work so that the plow or crew can build the line as they follow.

Dozers will come with various types of blades and control systems. There are two types of blade control systems used on dozers. These are cable and hydraulic. Almost all dozers produced during the past 30 years will have the hydraulic system. Cable systems were common before that period; however, there are still some of the older dozers with cable system in use.

Cable controlled systems are best used in light fuels for light scarification of soil, for finishing fireline, and for road grading.

Hydraulic systems can exert pressure down as well as raise the blade, thus are best used for digging in hard ground, cutting through roots, cross ditching or water barring, digging sumps and pits, and downslope breaking action. The hydraulic control is also helpful if the dozer becomes high centered or stuck and the terrain needs to be built up under the tracks.

The four common types of blades and their best uses in fire suppression are:

- Straight blade. It can usually be angled and push soil to either side of the dozer. This is not true with the other types; therefore, the best uses for straight blades are: pioneering and finishing fireline, cross ditching (water barring), road construction and maintenance.

- "U" blade. Best used for pioneering fireline when followed up by a straight angle blade, sump digging, and earth moving (as in road construction). A semi-U blade may be more common in firefighting.

- Brush blade. The best uses for brush blades are pioneering in brush, clearing and piling slash, mopup work, and certain rehabilitation work.

- V blade. Best used in swampy ground as dirt is thrown to both sides in front of dozer for tracks to ride up on. Also good for punching through dense stands of small diameter fuels (pioneering). Not good in rocky ground or steep slopes.

Line location is as important for dozers as for handtools, and the same principles of width, depth, and location apply. Locate the line in accordance with the fire control strategy, vegetation, and terrain. The line should be located well ahead of the dozers but not so far that the line location would need to be changed by the time the dozers get there. The locator should check periodically with the spotter or operator of the lead dozer or with the dozer boss to advise them of what is ahead.

Locations where dozers cannot work effectively should be avoided and completed with handtools. These locations would include areas of large rocks, rock outcrops, excessively steep terrain, or other limitations to the use of dozers. Trench undercut lines, and treat all hazards in the same manner as hand line construction and mopup.

The principles of direct, parallel, and indirect attack also apply to dozer line construction; and, as a general rule, all dozed material should be case outside the line and scattered. In a very few instances the dozer might be used on very small fires to push the burning edge into the fire area all the way around the perimeter. This is not a highly recommended practice.

Dozers are extremely effective tools for building firelines, particularly in heavy fuels and brush. They must be followed with handtools to finish the line, to burn out where necessary, to hold the fire within the line, and to combat slopovers and spot fires.

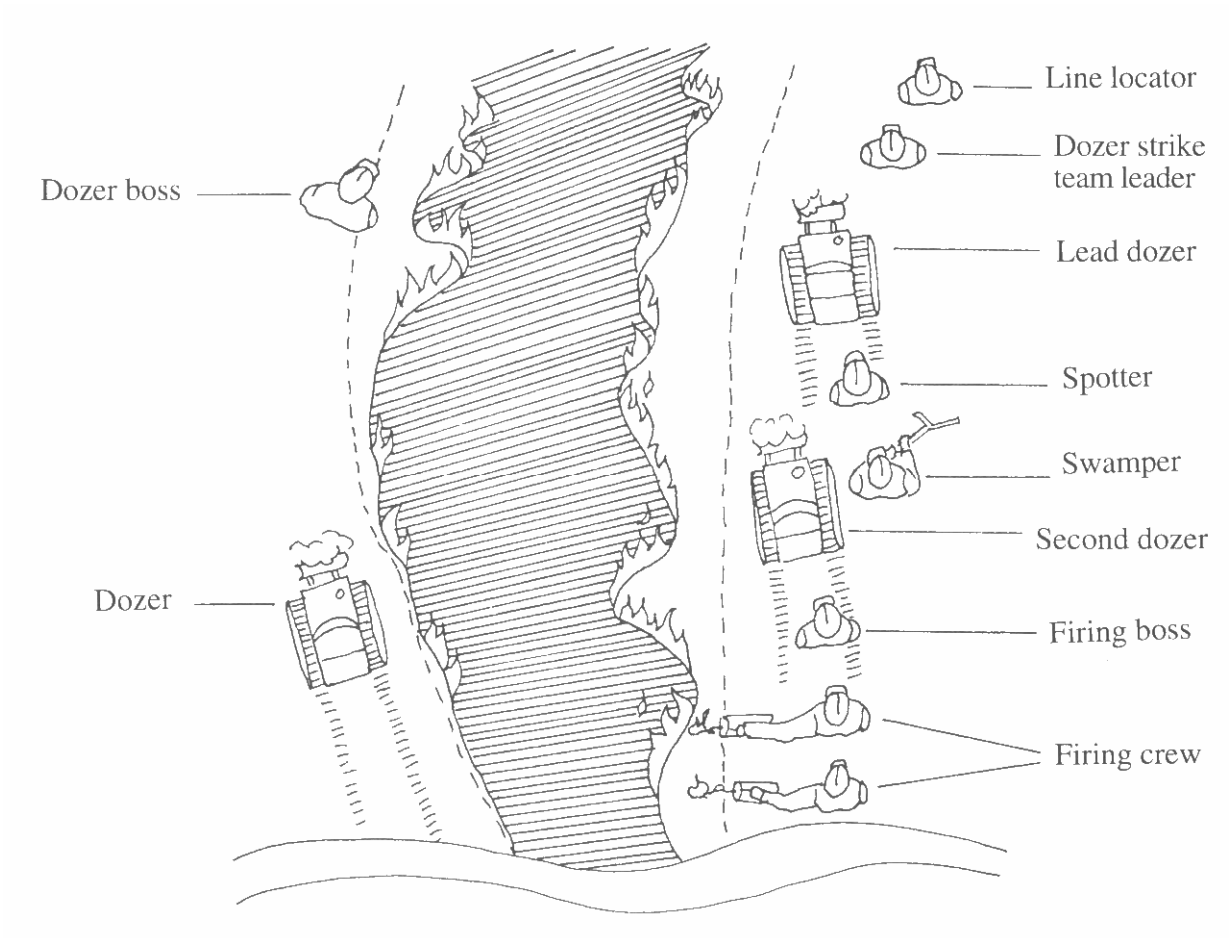
Once the fireline is built, it is necessary to begin the mopup from the fire edge toward the center of the fire, and this operation requires handtools. Often, engines or hose lines can be used to assist with holding action and mopup. Much will depend on the kind and volume of fuels. Dozers can be used to a limited extent on mopup operations.

Often it is practical and desirable to build the dozer line where it will serve as an access road for engines and the movement of crews. Grade along the line then becomes important so that four wheel drive vehicles can travel. This use is very valuable but should not dictate the location of the fireline. The location for fire control purpose must take precedence.

It may be necessary for dozers to clear out safety areas. These should be built well in advance of probable need.

Dozer organizations will vary with the size of the fire, the kind and amount of fuels, the topography, the practice in that locality, and the personnel available. On a large fire with several dozers a dozer boss or dozer strike team leader will normally supervise dozer operations (see Figure 5).

Figure 5 – Dozer Organization on a Large Fire



In heavy going, a spotter, swamper, line locator, and hand crew may be assigned to assist with dozer line construction. Because of the danger from rolling rocks and/or debris, no personnel should work directly below a dozer.

At least one person should be assigned to each dozer as a swamper. The contractor will normally provide a swamper for contract dozers. The swamper is to:

- Handle the winch line and choker, help change blade positions, assist with the maintenance, and otherwise assist the operator of the dozer.

- Communication by hand signals with the dozer operator.

- Cut away projecting branches and sticks that may jam the machine and cause damage or endanger the operator, to remove rocks and debris from the machine on signal from the operator, and to cut with an ax or chain saw where necessary to move logs and tangled windfalls.

- Work as a spotter if one is not assigned or as a contact between the operator and the spotter.

- Act as an alternate operator.

Since mechanical equipment is generally noisy and it's difficult for operators to hear other personnel in the area, a simple but effective communications system can be accomplished through the use of hand signals and other signals (see Figure 6).

Figure 6 – Dozer Hand Signals

By gunning the dozer motor twice, the operator can signal that he cannot see the spotter. By gunning the motor once, he can signal that he wants the helper to come to the dozer.

The following are good dozer line construction principles:

1. Utilize anchor points and LCES (lookouts, communications, escape routes, and safety zones).

2. All unburned fuels should be cast away from the fireline and scattered to the extent possible.

3. Where both soil and debris must unavoidable be pushed to the inside, spread and scatter this material well back into the burn.

4. In fuel types with down timber it may be best to use power saws ahead of the lead dozer to "buck" the material.

   Chain saw crews should be closely supervised, kept well ahead of the dozer, and avoid doing work the dozer can do. Saw crews are not needed if the lead dozer is large enough to do the job or if it can do the job without creating excessively large piles of debris.

5. Snags can be quickly felled by dozers. Where snag felling is hazardous to dozers, the job should be done by felling crews. Local practices will vary for different sections of the country.

6. Consult with the operator (both operator competence and dozer capability) before assigning dozer work in steep terrain and contouring sideslopes.

7. Generally, two dozers should work together in pairs or tandem when constructing fireline. They can reinforce each other and assist each other if one dozer needs help. The largest machine or the one in the best condition should serve as the lead dozer. Neither machine should be operated below the other on slopes or too close together because of the danger of rolling and falling material. If a narrow fireline is needed, the lead dozer pioneers the line by doing the rough clearing job and the second dozer cleans up the line. If a wider fireline is needed, both dozers may be doing a substantial amount of clearing; however, the second dozer still cleans up the line.

8. The line may be wider in some sections than in others depending on the job it is intended to do. There must be a reason for extra width of line. It may be because the brush is tall and thick, because the canopy needs to be opened up, or to keep the crew from being scorched during burnout.

   The line should be wide enough to hold the fire; usually 1½ times the height of the fuel in brush and not less than one-half the height of the fuel in timber.

   It is often impractical to make it wide enough to withstand a run of the fire. Enough area must be burned out from the line toward the fire to contain it and any spotting.

9. Use a cleanup crew behind the dozer to speed up the line construction and to make it secure. The job of the clean crew is to prepare the line for burnout by reducing the kind and amount of fuel along the edge of the line so that the chances of radiated heat and mass transport across the line will be reduced. The job is accomplished by:

   - Felling snags on both sides of the line.
   - Felling leaners.
   - Breaking up, tearing apart, flattening, and dispersing accumulations of fuel close to the line.
   - Lopping and scattering tops and branches and cleaning up the lower stems of standing trees by cutting off limbs, moss, and vines.
   - Making sure the line is continuous and free of surface fuels.

   Normally, three to six people are needed in a clean up crew plus a squad boss. They may be part of the burnout crew if the cleanup job is light.

   The main point here is that hand tools are needed to follow the dozers in any type of fuel to make sure the line is ready to burn out and hold. The cleanup crew must stay away from the immediate area around the dozers, since they are constantly backing and maneuvering.

10. The burnout crew may be part of a combination crew that does both cleanup and burnout. On larger fires it will be separate and supervised by a squad boss or a crew boss according to its size.

    If burning out follows the dozers, it should not follow so close that the firing will handicap the dozer's operation or jeopardize the line construction and cleanup.

11. Proper supervision must be provided for hired equipment. Proper organization and supervision are the keys to successful operation of equipment.

12. Provision must be made for servicing equipment as soon as the equipment moves onto the fire. These are expensive machine, and they cannot be operated long without servicing.

13. Dozers and tractor/plows must be properly equipped.

    - They should have canopies of sufficient strength to withstand rolling over and to protect operators from falling material.

    - The dozers should be armored underneath.

    - They should have functioning lights, both front and rear when it is dark.

    - They should have seat belts.

    - They should have a fire extinguisher and shovel.

    - They should have a properly functioning spark arrestor.

    - Operators must be supplied with required personal protective equipment, including fire shelters. It may be necessary to instruct the operator on the proper use of the fire shelter.

Key Points to Consider in Steep Topography, in Poor Access, in High Winds, or in High Fire Rate of Spread Areas

1. **Stay away from** narrow ridgelines, narrow being 100 feet or less across the top.

2. Allow the dozer operator plenty of lead-time to construct a break.

3. Put in safety zones a **minimum** of 100 feet in diameter every 600 feet or less if fuel types are medium or heavy brush (see Safety Zone Guidelines in the IRPG).

4. Follow-up any indirect line constructed with qualified Type 1 crews to burn out the line.

5. If possible, have air tactical group support any indirect line construction put in by the dozer(s).

When constructing line, production rates mentioned earlier were single-pass construction and are bare minimums. Remember, if backing off of direct attack and using indirect, the sooner the break the better. The key is to plan out the objectives with adequate time for dozers to complete the assignment.

The dozers may have to make 4 or 5 widths plus safety zones. If the fire is spreading up the drainage toward the ridge and the width is less than hoped for, it can be widened by pre-treatment with air tanker support if available. This retardant line or "wet line" will buy personnel and equipment on the ridge some time and afford a safety zone.

Remember, if pre-treatment is used, hold off until the last minutes that will still enable a retardant line to be completed. Fire retardant/foam can stay "wet" for one hour depending on winds and heat.

The majority of wildland fires are 10 acres or less when dozers arrive on the scene. When they arrive, they usually unload and start around the hot flank and encircle the fire. If pockets of fuel(s) remain, (referring primarily to grass) engine personnel or hand crew(s) should burn out islands or pockets that might later threaten to go across control lines.

It is also prudent for the incident commander or operations section chief to review the line constructed to make sure objectives are met. Ensure that no dozer piles remain and snags that might pose a fire or safety problem are mitigated. Check with line personnel for any specific small jobs and if none remain then release the dozer.

LCES CHECKLIST

LCES must be established and known to ALL firefighters BEFORE needed.

Lookouts

- Experienced / Competent / Trusted
- Enough lookouts at good vantage points
- Knowledge of crew locations
- Knowledge of escape and safety locations
- Knowledge of disengagement trigger points
- Map / Weather Kit / Watch / IAP

Communications

- Radio frequencies confirmed
- Backup procedures and check-in times established
- Provide updates on any situation change
- Sound alarm early, not late

Escape Routes

- More than one escape route
- Avoid uphill escape routes
- Scouted: Loose soils / Rocks / Vegetation
- Timed: Slowest person / Fatigue and Temperature factors
- Marked: Flagged for day or night (NFES 0566)
- Evaluate: Escape time vs. Rate of Spread
- Vehicles parked for escape

Safety Zones

- Survivable without a fire shelter
- Back into clean burn
- Natural Features: Rock areas / Water / Meadows
- Constructed Sites: Clearcuts / Roads / Helispots
- Scouted for size and hazards
- Upslope?
- Downwind? — More heat impact – Larger safety zone
- Heavy Fuels?

Escape time and safety zone size requirements will change as fire behavior changes.

It seems that most injuries and fatalities occur with one or more of the following common elements:

1. Grass or sage fuel bed(s).
2. Failure to recognize changing fire behavior.
3. Taking small fire for granted.
4. Topography modified fire spread.
5. Inexperience in wildland firefighting.
6. Poor physical condition.
7. Failure to recognize a transition fire (reference IRPG).

There are four major common denominators of fire behavior on fatal and near-fatal fires. Such fires often occur:

1. On relatively small fires or deceptively quiet areas of large fires.

2. In relatively light fuels, such as grass, herbs, and light brush.

3. When there is an unexpected shift in wind direction or in wind speed.

4. When fire responds to topographic conditions and runs uphill.

Alignment of topography and wind during the burning period should always be considered a trigger point to re-evaluate strategy and tactics.

Even with the smallest grass fire, no attack should be made unless an anchor point has been established. This anchor provides security and safety during a basic flank attack. It also prevents the fire from out flanking firefighters, should conditions change.

One of the more common errors made in light fuel beds is an over-aggressive attack (with the wind), making a wet line or running attack in such a hurry that spots are missed. Then visibility, heat, or driver zig-zag from black to green (unburned) causes an open line to occur. When this happens, firefighters can be outflanked or trapped if winds change or shift.

Grass fires are a common cause of firefighter fatalities, injuries, and burns because they can creep or explode across a field. Grass requires little preheating, and even the slightest wind can increase fire intensity and behavior. Grass fires produce three to four foot flame heights and 400-degree F aerial temperatures, even in short grass. These conditions exceed human ability to withstand heat and flame exposure. All grass fires, regardless of size and intensity, should be treated with caution. Anchor your attack using a natural or man-made barrier to keep the fire from later outflanking you or your personnel.

A basic flank attack working up the flank(s) from a common anchor point is recommended. If you only have a single resource, attack the hot flank first, working towards the head. If the fire has a large black area free from hazards or broken topography you can safely work in the black toward the head.

A number of fatalities have occurred when observers reported the fire was in the mopup stage and looked benign.

Topographic factors have also contributed to many fatalities, injuries, and burns. As pointed out in watch out situation 15, the wildland firefighter must understand the effects of:

1. Slope
2. Narrow canyons
3. Saddles
4. Chimneys
5. Narrow ridge line(s) (hog backs)
6. Broken topographic features

A slope primarily modifies fire behavior and, especially, rate of spread. If a fire burning on level terrain burns into a 30% slope, the rate of spread will double without any help from additional wind speeds or lowered relative humidity.

Narrow canyons, chimneys, or chutes modify fire behavior. Narrow canyons and well-defined drainages increase the rate of preheating and potential for spotting and area ignition. Chutes, chimneys, and saddles are paths of least resistance for a fire. Narrow ridgelines or hog back ridges are dangerous, because the radiant and convective heat is generally too high for firefighters to survive.

A fire moving across broken topographic features such as rock outcrops will have a tendency to finger a lot and spread erratically due to wind eddies.

In addition to safety factors, specific agency regulations apply to heavy equipment in forests.

Watershed Considerations

Install firelines where they can be properly drained later. Avoid locating firelines across concave slopes or areas that will create troughs.

If firelines must go across drainages, cross at a right angle to the drainage to minimize the disturbance.

Avoid wet areas such as seeps, springs, or meadows. Not only would disturbance result in resource damage but equipment can become stuck and fireline work can be delayed.

Scrape away only burnable vegetation and duff. Avoid deep cuts into the soil that will remove topsoil and reduce soil depth.

Keep organic debris and soil out of streams, if possible. Don't dam up running streams with debris. Debris in dry draws is not critical because it can be cleaned out during emergency rehabilitation.

For additional reading refer to local Best Management Practices and/or agency Minimum Impact Suppression Tactics guidelines.

Emergency Rehabilitation

The objective of emergency rehabilitation is to treat disturbed areas to prevent erosion and to leave the area in the pre-fire drainage pattern as much as possible.

Local conditions and standards will determine water bar spacing guidelines.

Make sure water bars are built into solid soil and not constructed with loose soil and organic debris. They must be deep enough to withstand abuse by 4-wheel traffic and breakdown by erosion or settling over time. The outlets of water bars must be open to function properly. Place water bar outlets where the soil is well protected by organic debris or natural rockiness so it can withstand runoff from the water bar at a 30% angle downslope. Don't locate water bars where they will divert a natural drainage.

Soil and debris that is pushed to the side during fireline construction acts as a berm and can cause runoff to concentrate over long distances. Break berms frequently between water bars. Where possible, push soil and organic debris displaced by fireline construction back onto the fireline. This will help restore topsoil and soil cover. Do this only if it does not cause excessive additional soil disturbance.

Special Considerations for Dozer Operations

1. Designated Areas

    * Wilderness
    * Primitive Areas
    * State/National Parks and Monuments
    * Reservations/Burial Grounds

2. Private Property

    * Land Line/Survey Monument
    * Landowner Permission
    * Travel Routes Approved
    * Private Bridges

3. Cultural Areas

    * Historical/Archaeological Sites
    * Cemeteries
    * Sacred Areas
    * Homesteads

4. Environmental

    * Wetlands
    * Marshy Areas
    * Meadows
    * Protected Biological/Botanical Areas
    * Stream Crossings, etc.

5. Human-made Concerns

* Bridge Load Limits

* Structures

* Hazmat from Structures/Dumps/Natural

* Fences/Gates

* Railroad Tracks

* Underground Utilities

  - Gas/Oil/Telephone/Water/Electrical/Cable
  - Sewer and Septic Systems
  - Mine Shafts
  - Above Ground Utilities
  - RAWS, earthquake detection, rain, and snow detection sites
  - Telephone/Cable/Oil/Electric Poles and Lines
  - Radio Transmission Sites
  - Oil and Gas Fields

* Paved and Surfaced Driveways, Highways, and Freeways

Dozer Terminology

1. Dozer
2. ROPS (Rollover Protection Structure); FOPS (Falling Object Protection Structure); brush package
3. Winch
4. Cable
5. Hook
6. Rippers
7. Tracks, sprockets, idlers, rollers
8. Pads
9. Grousers
10. “C” Frame (angle dozer only)
11. Push arm (straight blade only)
12. Dozer blade (angle or straight)
13. Cutting edge
14. End bits
15. Tilt adjusters (manual type)
16. Tilt cylinders (hydraulic)
17. Belly pans
18. Rock guards
19. Operator’s Controls
    a. Switch (battery)
    b. Throttle and decelerator
    c. Start switch
    d. Power shift, manual shift, hydrostatic
    e. Master clutch (Johnson Bar if applicable)
    f. Steering clutches/differential steering
    g. Brakes and lock
    h. Blade control
    i. Winch control
    j. Tilt control

Jobs that may be Performed by the Dozer Boss to Assist the Dozer Operator

1. Assist in loading and unloading the dozer

    a. Ask the operator

    b. Watch for traffic and bystanders

2. Swamping

    a. Get together ahead of time and learn dozer operator's way of thinking. Work with the operator.

    b. The swamper's job is to safely assist and guide the operator. This means the swamper must be OFF the dozer and far enough out to see any hazards.

    c. Consistently check the terrain, vegetation, and fire situation. Inform the dozer operator of important changes.

    d. If you are unsure of a situation, stop and inform the dozer operator.

    e. The basic job of the swamper is to be the "eyes" of the dozer operator. You must be out where the work is to be done looking for hazards and leading the dozer through the best locations.

    f. Assist in servicing dozer as necessary.

3. Winch Operation (assist)

   a. Keep hands and feet clear of cable and hook.

   b. Learn and use winch signals.

   c. Always wear gloves.

   d. When pulling cable out, grasp the hook.

   e. The operator will indicate the proper hook-up.

   f. Stand clear as the cable becomes taut. Never position yourself inside the bight. Never step over or straddle a tight cable.

4. Assist dozer operator with manual adjustments

   a. Blade angle direction

   b. Ripper shank depth

Dozer Maintenance Tips

Maintenance is the operator's responsibility. Dozer bosses can keep equipment working by assisting the operators and watching for these items when doing daily inspections and when constructing dozer lines.

Always change edges and bits before wear reaches the support. If wear has occurred on the support, check for burrs. Grind them off to insure that the edge or bit will fit flat against the support. Remove any soil that is packed between the edge or bit and the support.

Keep bit and edge hardware tight at all times. In the case of end bits, loose or missing bolts can result in failure. Use only high strength bolts and heat treated nuts with DH-2 Steel edges and bits. These fasteners exceed SAE Grade 8 standards.

Inspect bolt holes on the back side of edge and bit supports. Be sure there is a solid, smooth surface to support the nut. If not, it will be impossible to keep hardware tight. Repeated burning off of hardware can weaken support around the holes. Also, prolonged or repeated operation of the blade with loose hardware can cause bolt holes in support to become elongated.

Ripping may improve dozing. There may be a production advantage in ripping before dozing. The decision depends upon the material and job conditions. From the standpoint of prolonged service life, ripped material is always easier on ground engaging tools.

Reduced speed. Speed is the enemy of dozers and ground engaging tools. When a boulder or hard compact layer of material won't budge, a slow and steady prying force is more desirable than high speed impact.