Dozer

OUTLINE

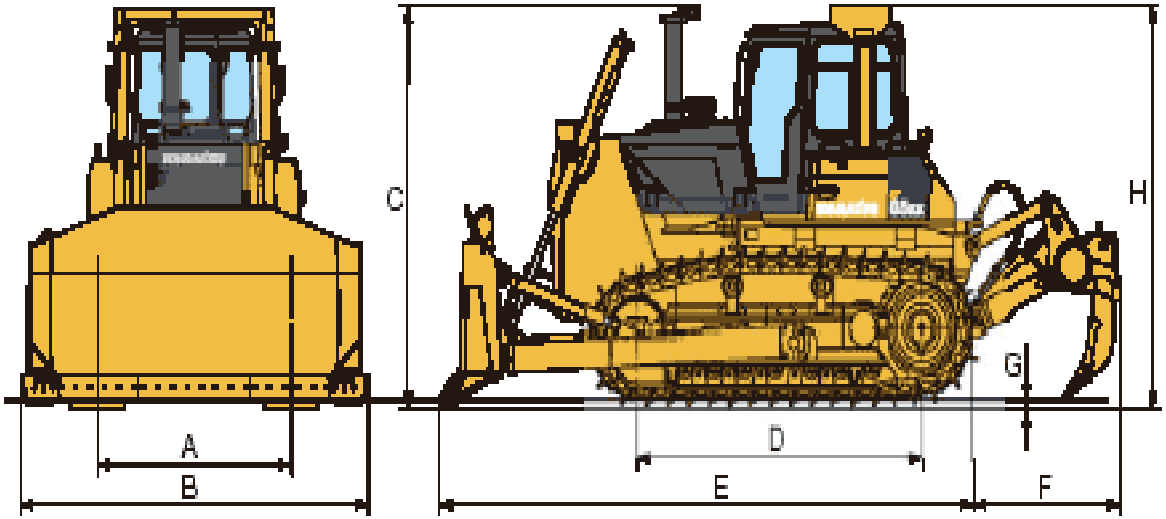
1. Introduction
2. Dozer Performance Characteristics
   - Classified on the basis of running gear
   - Blade
   - Dozer Function
3. Dozer Production Estimating
4. Dozer Safety

Introduction

- A dozer is Tractor unit that has blade attached to push material from one location to another.
- It is designed to provide tractive power for drawbar work.
- The amount of material the dozer moves is dependent on the quantity that will remain in front of the blade during the push.

Introduction (2)

- Self-propelled machine used to push or pull objects / material by means of mounted attachment or drawbar
- Function
  - To doze dirt
  - To push or pull (add traction - drawbar) moving equipment
  - To pull ripper



Ground Clearance: 450 mm 1'8"


USN
CAT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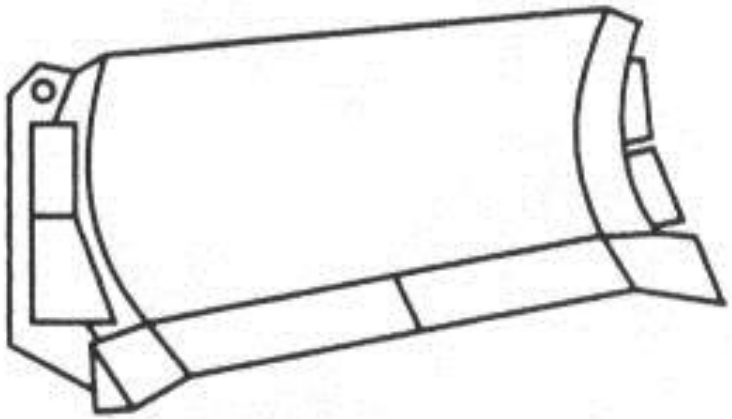
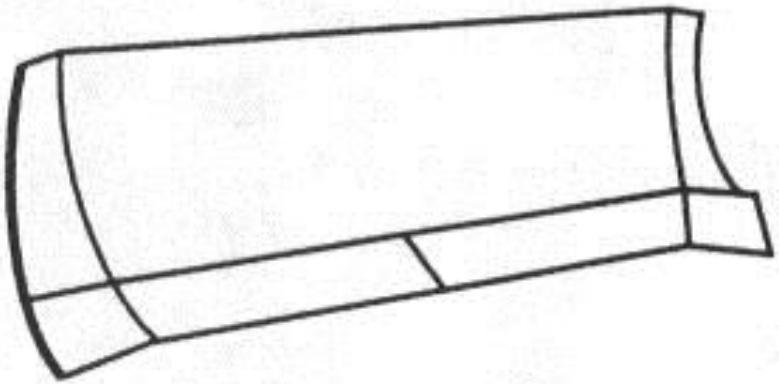
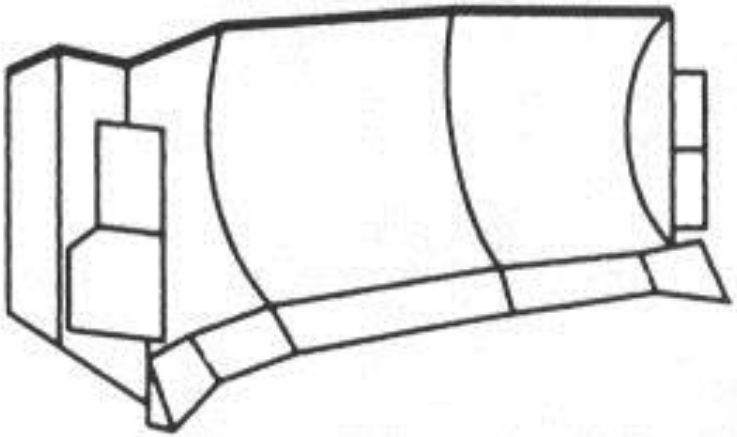


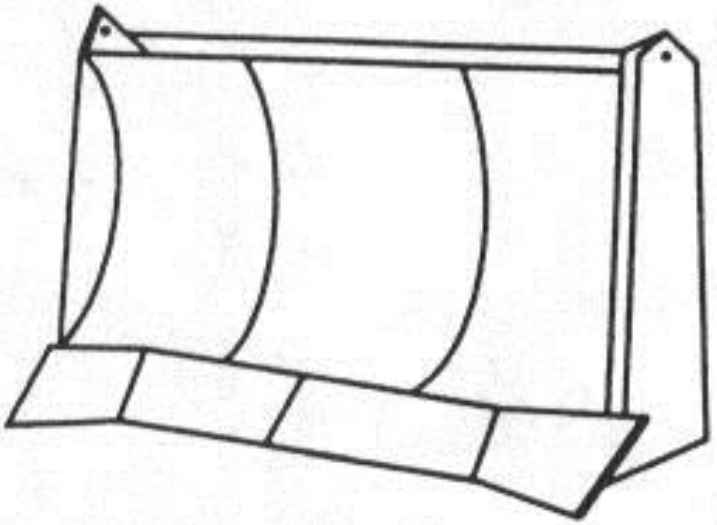
Straight blade



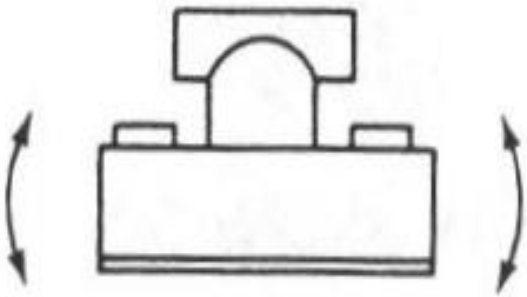
Angle blade



Universal blade

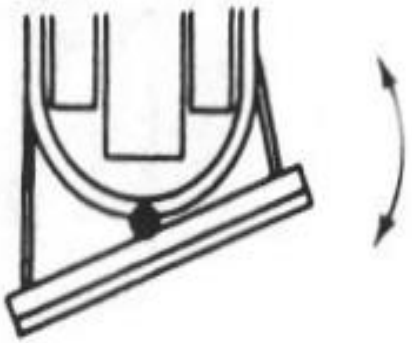


Cushion blade



Tilting

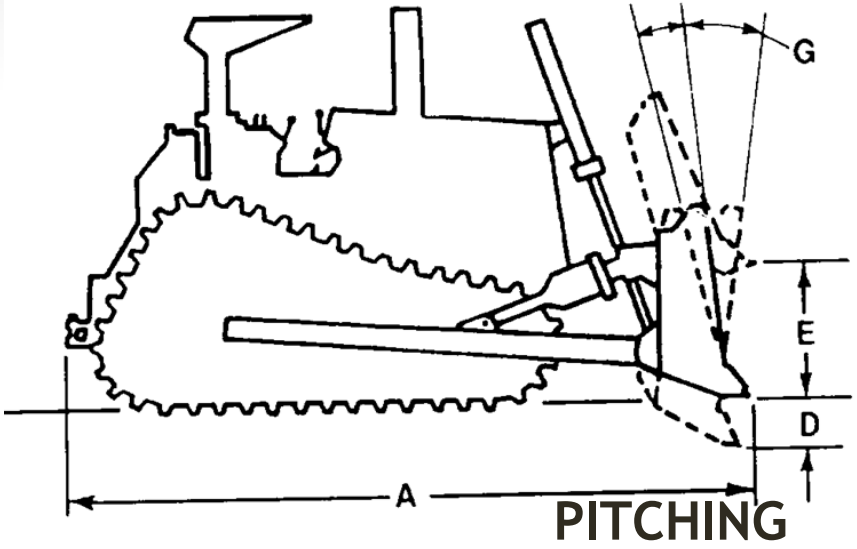
Pitching

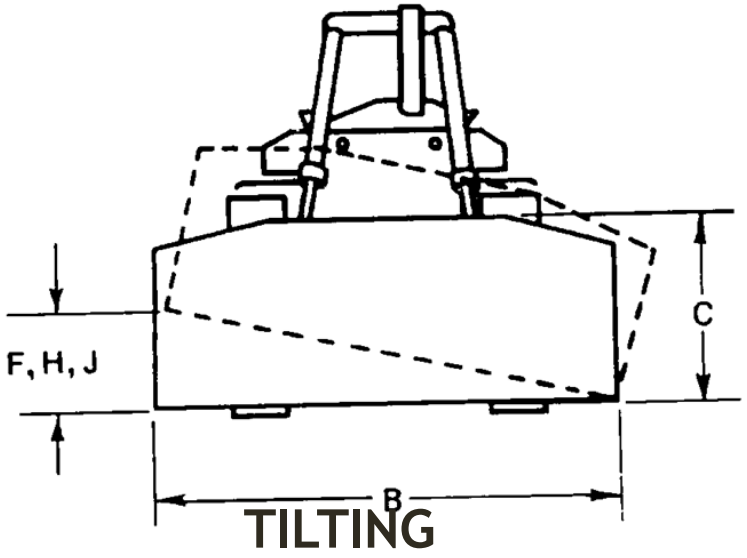


Angling

Dozer Performance Characteristics (2)

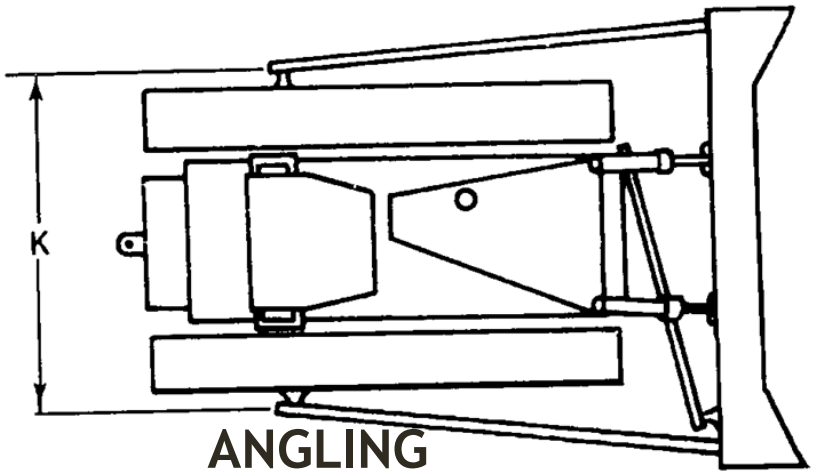
Dimension & Dozing Position





KEY:

A	Length (Blade Straight)
	Blade:
B	Width (including standard end bits)
C	Height
D	Maximum Digging Depth
E	Ground Clearance @ Full Lift
F	Maximum Tilt (Manual)
G	Maximum Pitch Adjustment
H	Maximum Hydraulic Tilt
J	Hydraulic Tilt (manual brace centered)
K	Pusharm Trunnion Width (to Ball Centers)



Dozer Performance Characteristics

Classified on the basis of running gear:

- Crawler type
- Wheel type

Crawler Dozer	Wheel Dozer
Work on variety of soil	Good on firm soils and concrete
Work over almost terrain	Best for level and downhill work wet weather
Good for short work distances	Good for long travel distances
Can handle tight soil	Best in handling loose soils
Slow return speeds, 5-10 mph	Fast Return speeds, 8 -26 mph
Can push large blade loads	Can handle only moderate blade loads

Dozer Performance Characteristics (3)

Dozer Function

Stripping

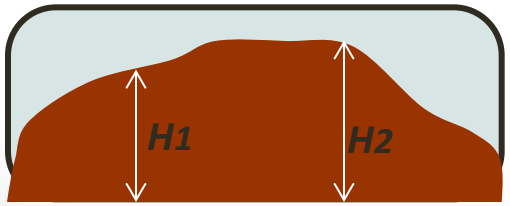
Backfilling

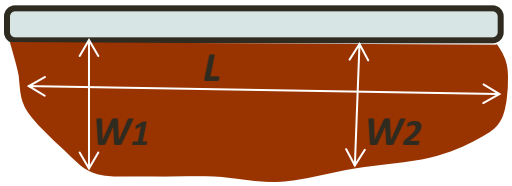
Spreading

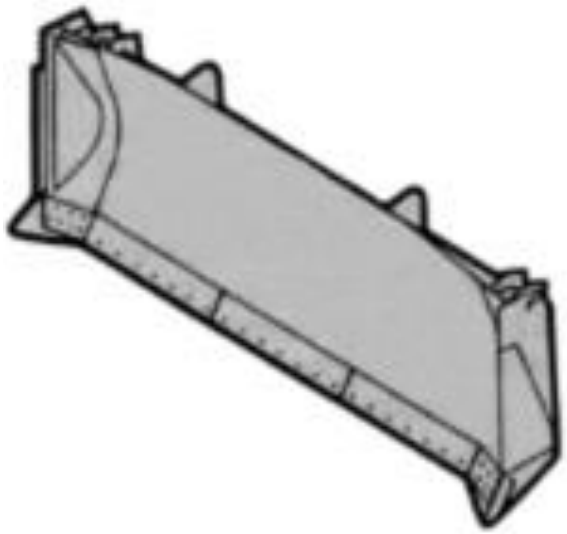
Dozer Production Estimating

Dozing Productivity

- Blade volume, $V_b = 0.8HWL$
- Production, $P_b = (V_b)/(T_p + T_r + T_m)$
  - H = height of pile of dirt at the inside edge of each track
  - W = width of pile at the inside edge of each track
  - L = length of dirt pile $\approx$ width of blade
  - T_p = time to push (doze)
  - T_r = time to return (usually backward in reverse)
  - T_m = time to maneuver







Estimating Dozer Production

- **Total Cycle Time = Fixed Cycle Time + Variable Cycle Time**

- **Dozer Production = (Blade Capacity * Efficiency)/ Total Cycle Time**

Estimating Dozer Production

- **Fixed Cycle Time:**

  Maneuver, Gear Change, Loading & Dumping.

Typical Dozer Fixed Cycle Times	
Operating Conditions	Time (min)
Power-Shift Transmission	0.05
Direct-Drive Transmission	0.10
Hard Digging	0.15

Estimating Dozer Production

Variable Cycle Time:

- **Doze & Return.**

Typical Dozer Operating Speeds	
Operating Conditions	Speeds (mph)
Hard Materials, Haul < or = 100 ft	1.5
Hard Materials, Haul > 100 ft	2.0
Loose Material, Haul < or = 100 ft	2.0
Loose Material, Haul > 100 ft	2.5

Dozer Production

$$\text{Cycle Time} = \textit{pushtime} + \textit{returntime} + \textit{maneuvertime}$$

$$\text{Production} = \frac{\text{blade load x 60 min}}{\text{cycle time}}$$

$$\textit{UnitCost} = \frac{\text{O \& O perhour x operator perhour}}{\text{production on job efficiency}}$$

Dozer Production Example

- A power-shift crawler tractor has a rated blade capacity of 10 LCY.
- The dozer is excavating loose common earth and pushing it a distance of 200 ft.
- Maximum reverse speed in third range is 5 mph.
- Estimate the production of the dozer if job efficiency is 50 min/h.

Dozer Production Example

- **Fixed Time = 0.05 min (Table 4-4)**
- **Dozing Speed = 2.5 mph (Table 4-5)**

$$\text{Dozing Time} = \frac{200\text{ ft}}{2.5\text{ mph} \times 5280\text{ fpm}} x60\text{ min}/hr = 0.91\text{ min}$$

$$\text{Return Time} = \frac{200\text{ ft}}{5.0\text{ mph} \times 5280\ fpm} x60 mim/hr = 0.45\text{ min}$$

$$\text{Cycle Time} = 0.05 + 0.91 + 0.45 = 1.41\text{min}$$

$$\text{Production} = \frac{10\text{ lcy x }50\text{ min/hr}}{1.41\text{ min}} = 354.6\text{ LCY/hr}$$

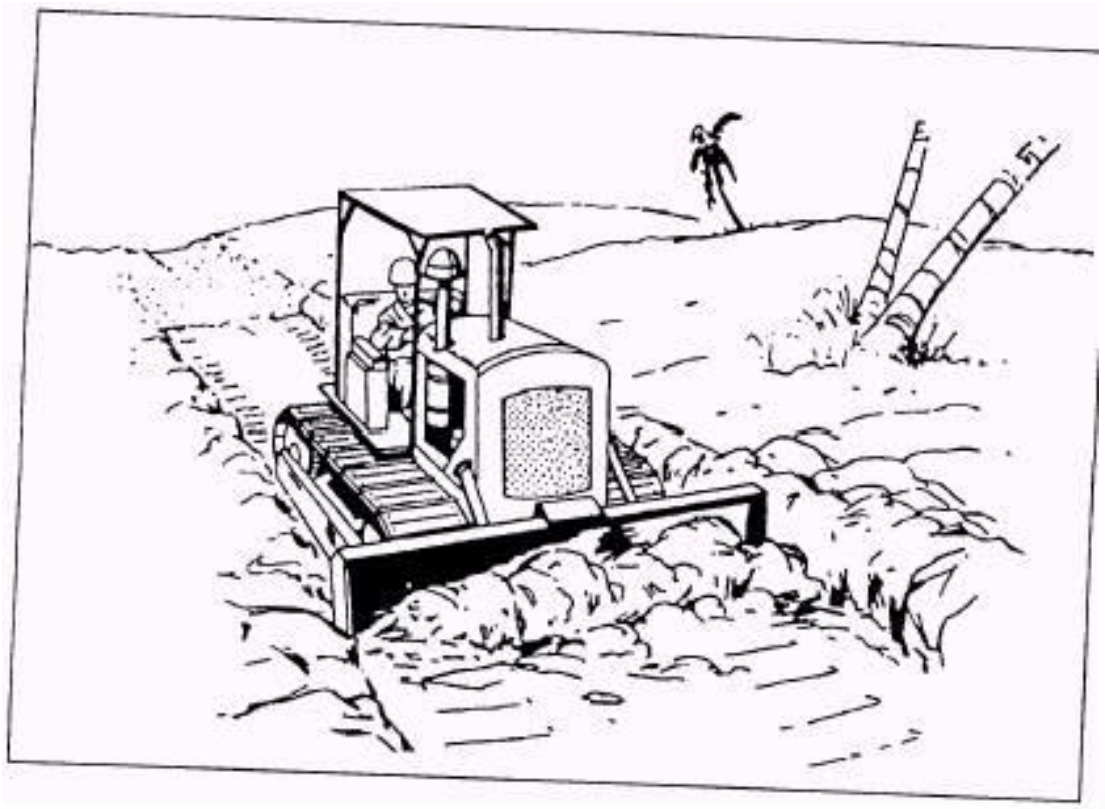
The machine in example above has an Owning & Operating cost of $ 40.5 per hour. Operator in the area where the proposed work will be performed are paid a wage of $ 15.5 per hour. What is the unit cost for pushing the material?

$$UnitCost = \frac{40.5 + 15.5}{354.6} = \$0.157\, perlcy$$

Job Management ~ Techniques

- **Downhill Dozing**
  - Minimal grade resistance
  - Blade load is increased
  - Reduces cycle times
- **Slot Dozing**
  - Shallow trench or path cut between loading and dumping areas to increase the blade capacity that can be carried on each cycle.
  - As much as 50% increase in capacity.
- **Blade-to-Blade Dozing**
  - Combined capacity is greater than each separately.
  - Can be mechanically coupled for large jobs.

Slot Dozing



Blade to Blade Dozing

FIGURE 6.9 | Blade-to-blade dozing used to increase production by minimizing spillage.

Practice

Dozing performed at a slow speed 2 mph. Return speed Is 4 mph whit maneuve time is about 0.05 min. The dozer is excavating loose common earth and pushing it a distance of 95 ft. A track dozer can push an average blade load 7 lcy. Owning & Operating cost of $ 50 per hour. Operator in the area where the proposed work will be performed are paid a wage of $ 12 per hour.

Q..?

1. What production in loose cubic yard can be expected?
2. Assume a percent swell of 0.25 and a job efficiency equal to 45 min per hour. What is the actual production that can be expected in bank cubic yard..?
3. What is the unit cost for pushing this material?

$$\text{Cycle Time} = pushtime + returntime + maneuvertime$$

$$\text{Production} = \frac{\text{blade load x 60 min}}{\text{cycle time}}$$

$$UnitCost = \frac{\text{O \& O perhour x operator perhour}}{\text{production on job efficiency}}$$

Practice

Answer

$$\text{Dozing Time} = \frac{95\ \text{ft}}{2.\ \text{mph} \times 5280\ \text{fpm}}\ x60\ \text{min}/\ hr = 0.54\ \text{min}$$

$$\text{Return Time} = \frac{95\ \text{ft}}{4\ \text{mph} \times 5280\ \text{fpm}}\ x60\ \text{min}/\ hr = 0.27\ \text{min}$$

$$\text{Production} = \frac{7\ \text{lcy x}\ 60\ \text{min}/\text{hr}}{0.86\ \text{min}} = 488.37\ \text{LCY}/\text{hr}$$

Practice (2)

Answer

$$\text{Production} = \frac{488.37}{1.25} x \frac{45}{60} = 293\,\text{BCY/hr}$$

$$\text{U}nitCost = \frac{50+12}{293} = \$0.212\,perbcy$$

Thank You