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GLOSSARY OF TERMS AND CLASSIFICATION OF EARTH-MOVING MACHINERY

PART II DOZERS

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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Indian Standard

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PART II DOZERS

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GLOSSARY OF TERMS AND CLASSIFICATION OF EARTH-MOVING MACHINERY

PART II DOZERS

0. FOREWORD

0.1 This Indian Standard (Part II) was adopted by the Indian Standards Institution on 30 December 1968, after the draft finalized by the Construction Plant and Machinery Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Earth-moving plant and machinery is being extensively used on all major irrigation projects, road construction, land reclamation and other tests involving removal and shifting of earth. Earth moving machine has been in production in the country for over a number of years and the requirements have increased considerably in the last few years due to the overall increase in the development work and this has resulted in many manufacturers switching over their production to earth moving plant and machinery. With the increasing use and manufacture of earth-moving machinery in the country it has been considered necessary by the Construction Plant and Machinery Sectional Committee to lay down the guide lines for present and future manufacture to ensure that there is standardization in the equipment under production or likely to be produced in future in the country.

0.2.1 As a first step towards this end, a glossary of terms relating to earth moving machinery has been prepared with a view to unifying the various technical terms and expressions in connection with the manufacture and use of such machinery. This standard does not cover the requirements relating to design, manufacture and testing of equipment, which will be covered subsequently in separate standards.

0.3 For convenience of reference, the standard has been divided into five parts. IS : 4988 (Part I)-1969* covers the definitions for the terms applicable in general to all types of earth-moving machinery and not specifically to any one equipment.

*Glossary of terms and classification of earth-moving machinery: Part I General terms.

0.3.1 The terms applicable to a specific type of machinery are covered in separate parts as below:

IS: 4988 (Part II)-1968 Glossary of terms and classification of earth-moving machinery: Part II Dozers

IS: 4988 (Part III)-1968 Glossary of terms and classification of earth-moving machinery: Part III Motor and towed scrapers

IS: 4988 (Part IV)-1968 Glossary of terms and classification of earth-moving machinery: Part IV Excavators

IS: 4988 (Part V)-1968 Glossary of terms and classification of earth-moving machinery: Part V Motor graders

0.4 In the formulation of this standard, due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

0.4.1 While formulating this standard, due consideration has also been given to the type of equipment on the future plan of production by various manufacturers. In deciding the size and output of different types of machinery, for example, dozers, scrapers, motor graders and excavators, it has been kept in view that the power for prime mover required for different categories of equipment is similar. It has been endeavoured that a prime mover which is used for light dozer would also be suitable to provide power for light motor grader or a light excavator.

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1. SCOPE

1.1 This standard (Part II) gives definitions of terms applicable exclusively to dozers. The standard also lays down the classification and method to be adopted in calculating the output of dozers.

NOTE — The definitions of terms applicable in general to all types of earth-moving machinery are covered in Part I of the standard.

2. DEFINITIONS

2.1 Angledozer — A tractor fitted with a blade in front of it either cable-operated or hydraulically-operated which is capable of both tilting and angling. It gives a variations in the angle of the vertical-axial plane of the tractor to the verticle plane passing through the base of blade without varying the angle of the base of the blade with the line of ground rest of the tracks.

2.2 Angling (Side Casting Angle) — This is the movement of the blade around the vertical axis.

2.3 Bare Tractor — Automotive vehicle either crawler or wheeled having only those accessories which are necessary for its own movement and for simple traction used for towing another machine of its kind.

2.4 Bulldozer — A tractor fitted with a blade in front of it either cable-operated or hydraulically-operated, and capable of only tilting but not angling. The blade is moved parallel to itself whilst remaining perpendicular to the vertical-axial plane of the tractor, its base being parallel to the line of ground-rest of the tracks.

2.5 Cable Control Unit

2.5.1 *Front Cable Control Unit* — Consists in principle, of a single drum and is used primarily for the control of dozer blade.

2.5.2 *Blade or Rear Cable Control Unit* — Consists in principle, of two drums of independent control and allowing the motivation, principally, either of dozer blade (using one drum only) or a towed scraper (using both drums) or of other towed machines.

2.6 Cable Operated Dozer — A dozer, the blade of which is lifted by means of a cable.

2.7 Crawler Tractor — Automotive track laying vehicle.

2.8 Dozer — A dozer is essentially to excavate the ground to a lower depth and push in front of itself the excavated material. Irrespective of the ground, the dozer may be operated similarly for heaps or piles of different types of material.

2.9 Gauge, Tractor — Distance between the centres of two tracks.

2.10 Grouser — A ridge or a cleat across the track shoes which improves its grip on the ground.

2.11 Idler — A wheel or gear which changes the direction of rotation of shafts, or the direction of movement of a chain or belt.

2.12 Maximum Permissible Slopes of Tractor — The slopes defined in percentage shall be those which the bare tractor can negotiate, both longitudinally and transversely. The tractor shall maintain its stability and its parts shall be in good working order during and after operation.

2.13 Pitch — The angular movement of the blade about a traverse axis through the lower edge of the cutting edge.

2.14 Power Pump — Hydraulic or other types of pump which actuates ancilliary equipment.

2.15 Pusher — A tractor that pushes a scraper to help it to pick up load.

2.16 Ripper — A towed equipment provided with teeth or tines for breaking up hard soil or soft rock to a greater depth.

2.17 Rooter — A heavy duty ripper.

2.18 Side Casting Angle — It is the angle in degrees from the straight position to the angling position.

2.19 Sprocket — A gear that meshes with a chain or a crawler track.

2.20 Tiltdozer — Tractor fitted with bulldozer to which a large degree of tilt can be applied to either side. It gives a variation in the angle of the base of the blade without varying the angle of the vertical plane passing through the base of the blade.

2.21 Tilting — Movement of the blade about a fore and aft axis. The amount of tilt shall be in millimetres and shall be the amount by which one end of the blade can be raised above the other end.

2.22 Winch — A drum that can be rotated so as to exert a strong pull while winding in a line.

2.23 Wheeled Tractor — Automotive vehicle equipped with pneumatic tyred wheels.

3. OUTPUT OF DOZERS

3.1 Output — The output of a bulldozer shall be calculated according to the following formula:

$$\text{Output} = \frac{Q \times f \times E \times 60}{C} \text{ m}^3/\text{h}$$

where

Q = dozer blade capacity in loose cubic metres,
f = soil factor (*see* Table 1),
E = combined operator and task efficiency, and
C = cycle time in minutes (*see* Fig. 1).

3.2 Dozer Blade Capacity (Q) — Dozer blade capacity shall be calculated according to the following formula:

Approximate capacity of dozer blade in cubic metres $= 1/2\ H^2 \times W$

where

H = height of the blade in metres (*see* Fig. 2), and
W = width of the blade in metres (*see* Fig. 2).

TABLE 1 SOIL CONVERSION FACTORS

(*Clause* 3.1)

Sl No.	Material	State	Convert To		
			Bank	Loose	Compacted
i)	Sand	Bank	1·00	1·00	0·92
		Loose	1·00	1·00	0·92
		Compacted	1·09	1·09	1·00
ii)	Common earth	Bank	1·00	1·05	0·88
		Loose	0·95	1·00	0·84
		Compacted	1·14	1·19	1·00
iii)	Clay	Bank	1·00	1·20	0·80
		Loose	0·83	1·00	0·75
		Compacted	1·11	1·33	1·00
iv)	Rock	Bank	1·00	1·50	1·40
		Loose	0·67	1·00	0·93
		Compacted	0·71	1·07	1·00

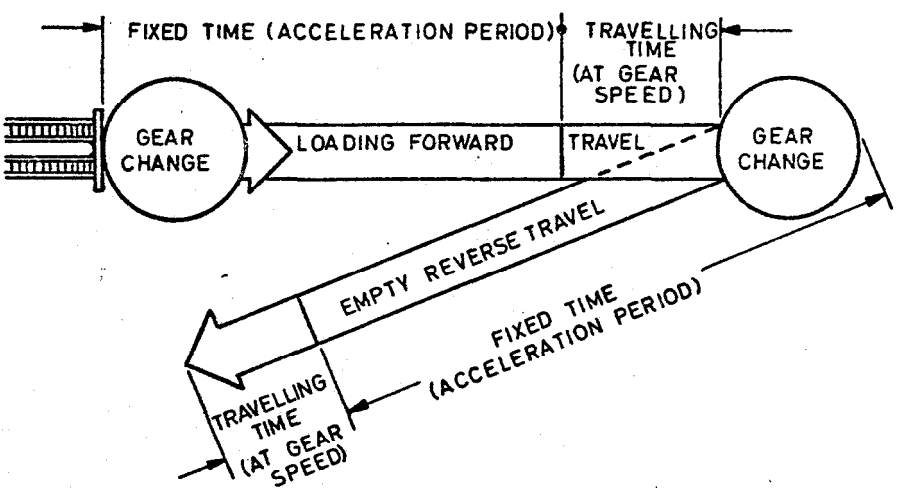

FIG. 1 BULLDOZER CYCLE OF OPERATION

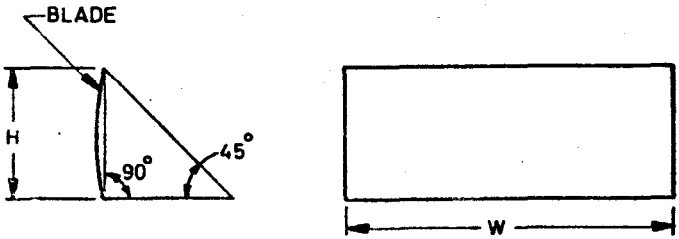

FIG. 2 DIMENSIONS OF DOZER BLADE

4. CLASSIFICATION

4.1 The classification of a dozer whether it is crawler or wheeled shall be based upon the drawbar horsepower equivalent to the flywheel horsepower to which the tractor is capable of delivering. This would be an accurate indicator to the user about the capabilities of the particular machine. Speed shall not be the criteria at which the drawbar horsepower should be measured. It shall be measured wherever the drawbar horsepower comes out to be the maximum. In any case to meet the consumer's interest, the manufacturer should also indicate the drawbar pull available at various normal working speeds of the vehicle.

4.2 Classification of the dozers shall be as given below:

a) Field-Drawbar horsepower equivalent to 60-80 Flywheel horsepower
b) Light- „ „ „ „ 90-120 „ „
c) Medium-„ „ „ „ 160-200 „ „
d) Heavy- „ „ „ „ 230-300 „ „
e) Super-heavy- „ „ „ „ above 350 „ „

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Conversion*
Force	newton	N	1 N = 0·101 972 kgf
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m²
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Pressure, stress	pascal	Pa	1 Pa = 1 N/m²

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