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GLOSSARY OF TERMS AND CLASSIFICATION OF EARTH-MOVING MACHINERY

PART V MOTOR GRADERS

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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GLOSSARY OF TERMS AND CLASSIFICATION OF EARTH-MOVING MACHINERY

PART V MOTOR GRADERS

0. FOREWORD

0.1 This Indian Standard (Part V) 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 machinery 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 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.

1. SCOPE

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

NOTE — The definitions of terms applicable in general to all types of earth-moving machinery are covered in IS : 4988 (Part I)-1969*.

2. DEFINITIONS

2.1 Circle — The rotary table in a grader which supports the blade and regulates its angle.

2.1.1 *Circle Reverse* — The mechanism which changes the angle of a grader blade.

2.2 Ditch Cleaner — This equipment is fastened to the levelling blade and is designed to clear ditches and to shape them as required by using a suitably shaped blade.

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

2.3 Elevator — This equipment is used to scrape off the vegetable layer of light or moderately heavy soil classification and by means of a conveyor, to load on to a lorry or more simply to drop it again at the side.

2.3.1 A variant allows for the materials to be thrown back to the rear of the grader.

2.4 Front Blade — This equipment is usually mounted at the front of the grader and consists of a shaped blade fastened to arms which can pivot on the grader frame. The frame and its blade can usually be raised or lowered by mechanical or hydraulic power. It is used to move piles or heaped material so that it can more easily be finished to the required level and surface by the levelling blade. It is not intended to be used to replace a bulldozer or angledozer.

2.5 Mould Board — Mould board that is levelling blade constitutes the principal equipment of the motor grader.

2.6 Motor Grader — A motor grader is a self propelled vehicle, of which the bearing chassis rests on at least two sets of wheels, and having an adjustable levelling blade, normally called mould board situated between these sets of wheels, used for fine finishing, cambering, battering and ditching.

2.7 Scarifier — This equipment is used to scarify or break up hard ground surfaces to a moderate depth. The equipment consists of a frame pivotted at one end to the grader frame and having secured at the other end a number of tines or teeth so that when the frame is lowered, the tines scarify and loosen the hard ground surface so that it can more easily be finished by the mould board that is levelling blade, to the required level and surface. The scarifier is generally positioned behind the front wheels but can be placed at other positions on the grader. It is usually operated by mechanical or hydraulic power.

2.8 Shoulder Reach — It is the amount by which a motor grader blade can be offset from its normal centre line position.

2.9 Snow Plough — This equipment is usually mounted at the front of the grader and consists of a specially shaped blade designed to cast the snow to both sides of the grader as the machine travels forward. The blade is fastened to arms pivotted to the grader frame and is usually operated by mechanical or hydraulic power. Other forms of snow plough are also used such as those employing rotating spiral blades.

2.10 Thrust on the Levelling Blade — The horizontal component of the thrust on the levelling blade and shall be measured with the machine in motion.

2.11 Tilting — It is the angular movement of the front wheels about a horizontal axis.

2.12 Transverse Inclination —This inclination, indicated in percent shall be that under which the grader may work, with all its parts in obvious good working order.

3. CLASSIFICATION

3.1 Mould board of all motor graders shall have width of four metres. However, the motor graders shall be classified as under:

Light	Drawbar horsepower equivalent to		90-120 flywheel horsepower	
Medium	,,	,,	,, 121-200	,,
Heavy	,,	,,	,, 201-300	,,

4. OUTPUT

4.1 The working of motor grader while grading a strip of road formation or a piece of ground is given in **4.1.1** to **4.1.5**.

4.1.1 Motor grader works on the soil while passing over it. It works to and fro in straight passes each as long and at as high a speed as the task and conditons allow. Work is carried out on both forward and return passes. Some types of work can be completed by a single pass while other types may need more than one pass to carry out the task.

4.1.2 Work of graders can normally be classified into following categories:

a) Graders working in major role, and

b) Graders working in subsidiary role.

4.1.3 *Reshaping and Regrading an Existing Road* — On these tasks graders would be in a major role and there shall be no interference or delay caused by other machines. The shorter the length of each pass, the greater the time lost in turns. For high output, passes should be as long as conditions permit.

4.1.4 *Grading and Shaping Top Layer of a Fill* — On this task the grader will be dependent on the rate of supply of fill. Passes are unlikely to exceed 300 metres and grader is likely to be working in a subsidiary role.

4.1.5 *Spreading and Roughly Shaping and Regrading Layers of Fill in an Embankment Prior to Compaction* — The grader will be working in a subsidiary role here, dependent on the rate of supply of fill from a major role plant. Length of pass is unlikely to exceed 100 metres and normally number of passes required shall be three.

4.2 Output of grader working in these conditions can be found out by a common formula given below for the area of ground treated:

$$\text{Area of ground treated, } A = \frac{S \times W \times E}{N} \text{ m}^2/\text{h}$$

where

S = speed of grader in metres per hour;

W = efficiency width of surface treated in each pass in metres (normally 2/3 the width of mould board);

E = efficiency factor, combining operator efficiency (assumed to be 0·75) and task efficiency (*see* Table 1) by multiplication; and

N = number of passes required over the same ground to complete the task.

TABLE 1 AVERAGE TASK EFFICIENCY FACTORS OF MOTOR GRADERS FOR PRELIMINARY ESTIMATES, MACHINE WORKING IN MAJOR ROLE

Sl No.	Role	Task Efficiency Factor				
		Length of Pass in Metres				
		50	100	200	600	Over 600
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	In a major role. Little or no interference by other machines	0·4	0·6	0·8	0·9	1·00
ii)	In subsidiary role, for example spreading and shaping fills brought by other machines	0·4	0·5	0·7	0·8	—

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