SECTION 1C

RIPPERS

CONTENTS

Multi-shank rippers(rigid type)

Highly efficient ripping of soft rock is possible with three shanks. The parallelogram ripper linkage maintains the shanks at the optimum digging angle during operation, regardless of the shank's penetrating depth.

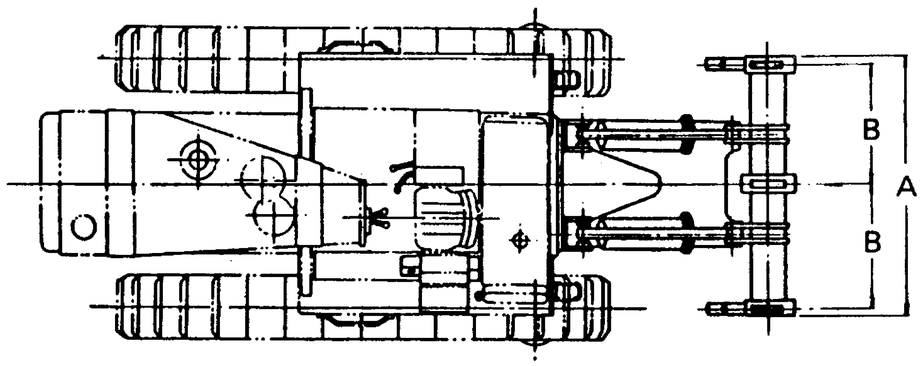
Multi-shank rippers(variable type)

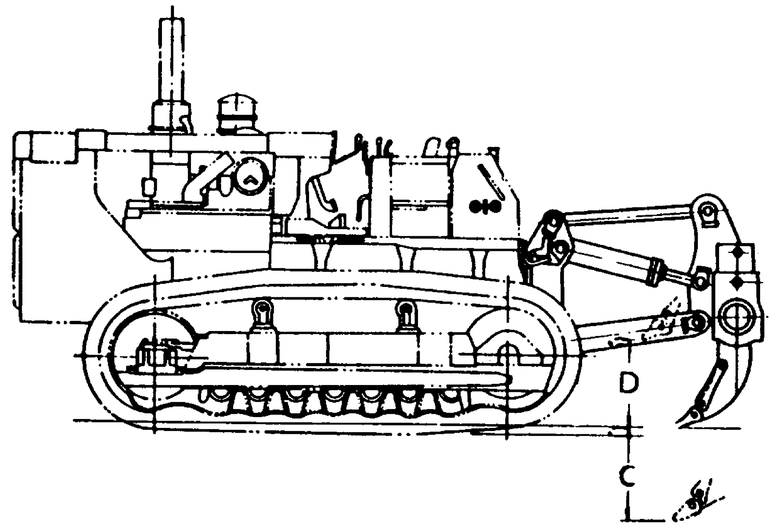
The ripper point angle can be varied hydraulically to suit the specific ground conditions.
The ideal movement of ripper points ensures powerful digging force throughout the entire digging angle range.

Giant rippers(variable type)

Specially made to handle hard rock with reinforced beam and a shank.
The tilt angle of the ripper point is adjustable for better penetration and fragmentation.

Specifications
Multi-Shank Ripper(Rigid type)





Item			Model D31E-18	D37E-2	D40A-3,D41A-3A D41A-3,D41E-3	D50A-17 D53A-17
	RIPPER EQUIPMENT:					
	Type		Tool bar	Tool bar	Parallelogram	Parallelogram
	Weight	kg(lb)	420 (930)	420 (930)	830 (1,830)	1650 (3,640)
A	Beam length	mm(in)	1529 (60.2)	1529 (60.2)	1555 (61.2)	1755 (69.1)
	Shanaks:					
	No.of shanks		5	5	3	3
	Tooth point		Replaceable	Replaceable	Replaceable	Replaceable
B	Pitch (3 shank)	mm(in)	*700 (27.6)	*700 (27.6)	700 (27.6)	800 (31.5)
	Pitch (2 shank)	mm(in)			1400 (55.1)	1600 (63.0)
	Digging angle		Fixed	Fixed	Fixed	2-Stage adjustable
	Digging depth		Fixed	Fixed	2-Stage adjustable	3-Stage adjustable
C	Max.digging depth	mm(in)	310 (12.2)	310 (12.2)	460 (18.1)	565 (22.2)
D	Max.lift above ground	mm(in)	440 (17.3)	440 (17.3)	400 (15.7)	525 (20.7)
	HYDRAULIC CONTROL UNIT	kg(lb)	20 (40)	20 (40)	20 (40)	50 (110)

* Pitch of 5 shanks

Multi-Shank Ripper(Rigid type)

Item		Model	D58E-1	D60A,E-8 D65A,E-8	D63E-1	D68E-1
	RIPPER EQUIPMENT :					
	Type		Parallelogram	Parallelogram	Parallelogram	Parallelogram
	Weight	kg(lb)	1650 (3,640)	1720 (3,790)	1720 (3,790)	1720 (3,790)
A	Beam length	mm(in)	1755 (69.1)	2075 (81.7)	2075 (81.7)	2075 (81.7)
	Shanks:					
	No.of shanks		3	3	3	3
	Tooth point		Replaceable	Replaceable	Replaceable	Replaceable
B	Pitch (3 shank)	mm(in)	800 (31.5)	950 (37.4)	950 (37.4)	950 (37.4)
	Pitch (2 shank)	mm(in)	1600 (63.0)	1900 (74.8)	1900 (74.8)	1900 (74.8)
	Digging angle		2-Stage adjustable	2-Stage adjustable	2-Stage adjustable	2-Stage adjustable
	Digging depth		2-Stage adjustable	2-Stage adjustable	2-Stage adjustable	2-Stage adjustable
C	Max.digging depth	mm(in)	565 (22.2)	570 (22.4)	520 (22.4)	570 (22.4)
D	Max.lift above ground	mm(in)	525 (20.7)	700 (27.6)	700 (27.6)	700 (27.6)
	HYDRAULIC CONTROL UNIT	kg(lb)	50 (110)	90 (200)	90 (200)	90 (200)

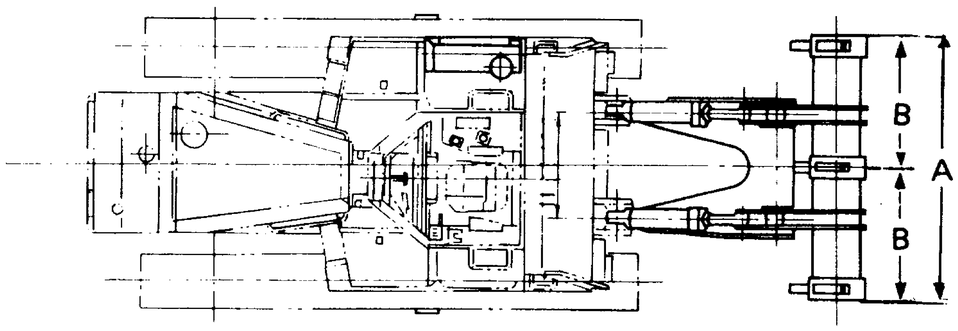
Specifications
Multi-Shank Ripper(Rigid type)

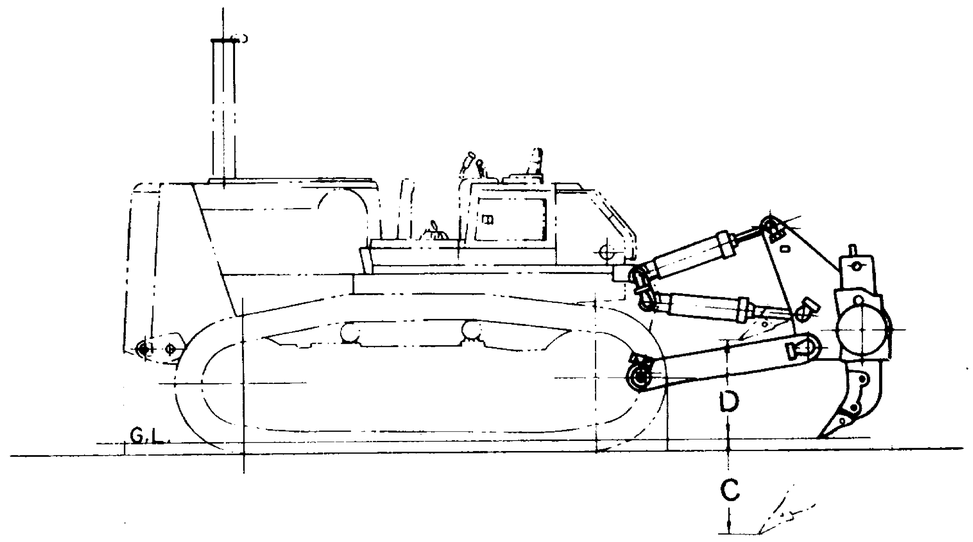
Item		Model /	D75A-1	D83E-1	D85A,E-21 D85A-21B
	RIPPER EQUIPMENT:				
	Type		Parallelogram	Parallelogram	Parallelogram
	Weight	kg(lb)	1630 (3,590)	1720 (3,790)	2700 (5,950)
A	Beam length	mm(in)	2110 (83.1)	2170 (85.4)	2227 (87.7)
	Shanks:				
	No.of shanks		3	3	3
	Tooth point		Replaceable	Replaceable	Replaceable
B	Pitch (3 shank)	mm(in)	950 (37.4)	950 (37.4)	1000 (39.4)
	Pitch (2 shank)	mm(in)	1900 (74.8)	1900 (74.8)	2000 (78.7)
	Digging angle		2-stage adjustable	2-stage adjustable	54.5°
	Digging depth		2-stage adjustable	2-stage adjustable	2-stage adjustable
C	Max.digging depth	mm(in)	650 (25.6)	570 (22.4)	665 (26.2)
D	Max. lift above ground	mm(in)	620 (24.4)	605 (23.8)	555 (21.9)
	HYDRAULIC CONTROL UNIT	kg(lb)	90 (200)	90 (200)	130 (290)

Specifications
Multi-Shank Ripper(Rigid type)

	Item / Model		D150A-1 D155A-1	D355A-3	D375A-1
	RIPPER EQUIPMENT:				
	Type		Parallelogram	Parallelogram	Parallelogram
	Weight	kg(lb)	4870 (10,740)	6400 (14,110)	5850 (12,900)
A	Beam length	mm(in)	2420 (95.3)	2854 (112.4)	2854 (112.4)
	Shanks:				
	No.of shanks		3	3	3
	Tooth point		Reversible	Reversible	Replaceable
B	Pitch (3 shank)	mm(in)	1120 (44.1)	1320 (52.0)	1320 (52.0)
	Pitch (2 shank)	mm(in)	2240 (88.2)	2640 (104.0)	2640 (104.0)
	Digging angle		45°	45°	45°
	Digging depth		2-stage adjustable	2-stage adjustable	2-stage adjustable
C	Max.digging depth	mm(in)	835 (32.9)	1020 (40.2)	1075 (42.3)
D	Max. lift above ground	mm(in)	890 (35.0)	850 (33.5)	875 (34.4)
	HYDRAULIC CONTROL UNIT	kg(lb)	45 (100)	45 (100)	40 (90)

Multi-Shank Ripper(Variable type)



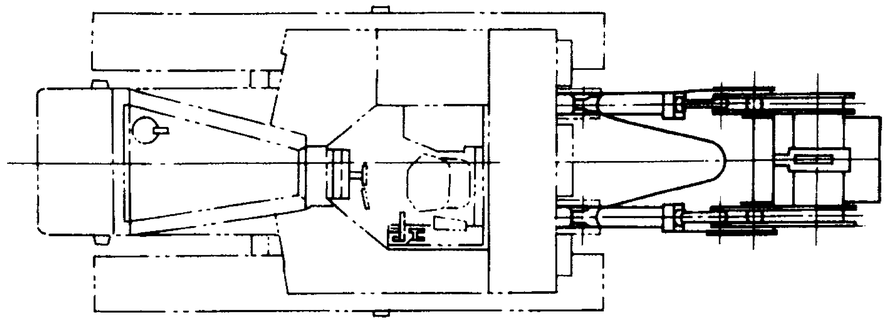


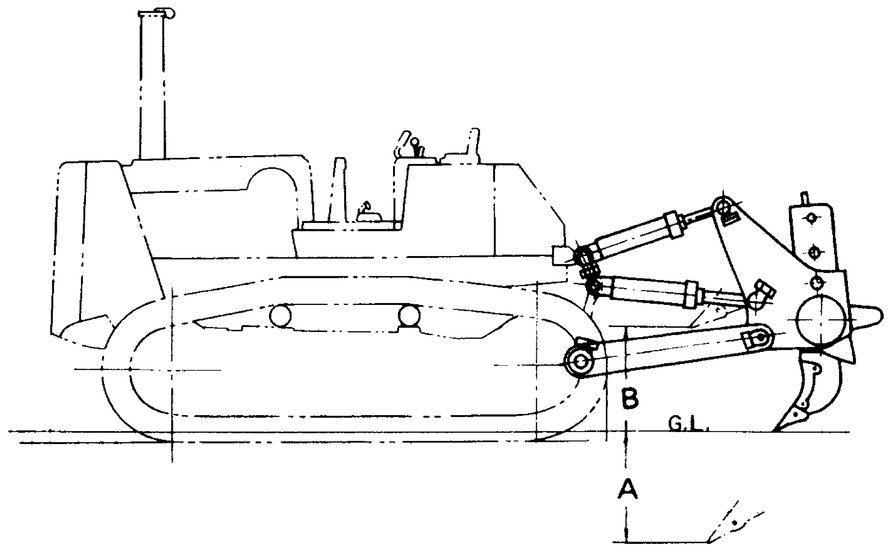
	Item / Model		D150A-1 D155A-1	D355A-3	D375A-1
	RIPPER EQUIPMENT: Type		Variable digging angle type	Variable digging angle type	Variable digging angle type
	Weight	kg(lb)	5300 (11,680)	6790 (14,970)	6280 (13,840)
A	Beam length	mm(in)	2420 (95.3)	2854 (112.4)	2854 (112.4)
	Shanks:				
	No.of shanks		3	3	3
	Tooth point		Replaceable	Reversible	Replaceable
B	Pitch (3 shank)	mm(in)	1120 (44.1)	1320 (52)	1320 (52)
	Pitch (2 shank)	mm(in)	2240 (88.2)	2640 (103.9)	2640 (103.9)
	Digging angle		Std:45° Stepless adjustable 34°30′~60°	Std:45° Stepless adjustable 36°50′~61°20′	Std:45° Stepless adjustable 32.5°~55.5°
	Digging depth		2-stage adjustable	3-stage adjustable	2-stage adjustable
C	Max.digging depth	mm(in)	835 (32.9)	1020 (40.2)	1075 (42.3)
D	Max. lift above ground	mm(in)	890 (35)	850 (33.5)	1030 (40.6)
	HYDRAULIC CONTROL UNIT	kg(lb)	90 (200)	90 (200)	76 (170)

Specifications
Multi-Shank Ripper(Variable type)

Item		Model	D455A-1	D475A-1	
	RIPPER EQUIPMENT:				
	Type		Variable digging angle type	Variable digging angle type	
	Weight	kg(lb)	10050 (22,160)	9600 (21,160)	
A	Beam length	mm(in)	2909 (114.5)	3085 (121.5)	
	Shanks:				
	No.of shanks		3	3	
	Tooth point		Reversible	Replaceable	
B	Pitch (3 shank)	mm(in)	1325 (52.2)	1385 (54.5)	
	Pitch (2 shank)	mm(in)	2650 (104.3)	2770 (109.1)	
	Digging angle		Std:43.5° Stepless adjustable 31°10′~58°	Std:45° Stepless adjustable 32.5°~54°	
	Digging depth		2-stage adjustable	2-stage adjustable	
C	Max.digging depth	mm(in)	1200 (47.2)	1180 (46.5)	
D	Max. lift above ground	mm(in)	980 (38.6)	1140 (44.9)	
	HYDRAULIC CONTROL UNIT	kg(lb)	—	120 (260)	

Specifications
Giant Ripper(Variable type)



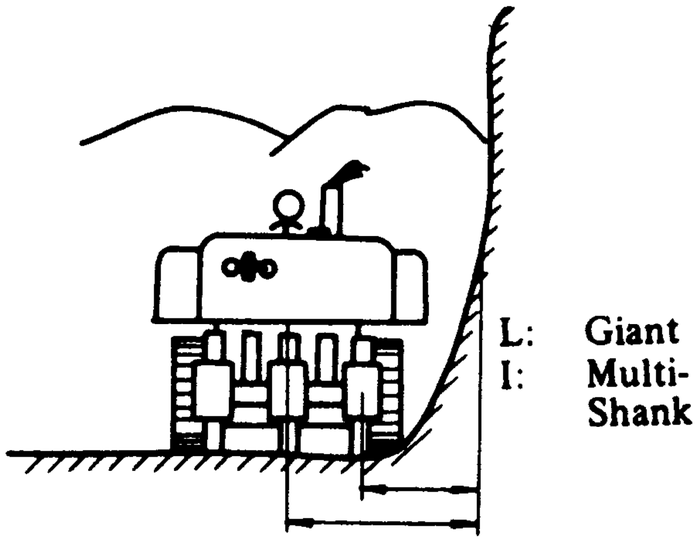
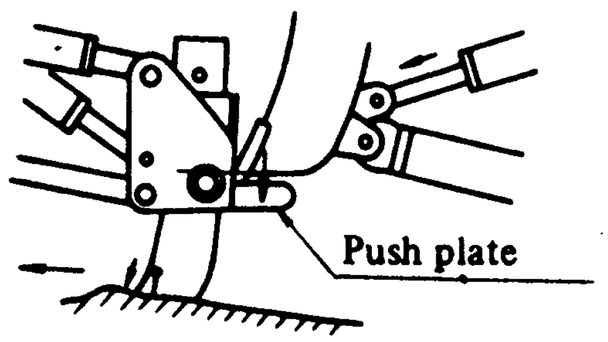


	Item		Model D150A-1 D155A-1	D355A-3	D375A-1
	RIPPER EQUIPMENT: Type		Variable digging angle type	Variable digging angle type	Variable digging angle type
	Weight	kg(lb)	4740 (10,450)	5350 (11,770)	5010 (11,050)
	Shanks:				
	No.of shanks		1	1	1
	Tooth point		Replaceable	Reversible	Reversible
	Digging angle		Std:45° Stepless adjustable 34°25′~60°	Std:45° Stepless adjustable 37°10′~61°21′	Std:45° Stepless adjustable 32.5°~55.5°
	Digging depth		4-stage adjustable	4-stage adjustable	4-stage adjustable
A	Max.digging depth	mm(in)	1240 (48.8)	1400 (55.1)	1435 (56.5)
B	Max. lift above ground	mm(in)	965 (38)	1130 (44.5)′	1350 (53.1)
	HYDRAULIC CONTROL UNIT	kg(lb)	90 (200)	90 (200)	76 (170)

Specifications
Giant Ripper(Variable type)

Item		Model	D455A-1	D475A-1	
	RIPPER EQUIPMENT:				
	Type		Variable digging angle type	Variable digging angle type	
	Weight	kg(lb)	8300 (18,300)	7240 (15,960)	
	Shanks:				
	No.of shanks		1	1	
	Tooth point		Reversible	Replaceable	
	Digging angle		Variable	Std:45° Stepless adjustable 34°~56°	
	Digging depth		5-stage adjustable	4-stage adjustable	
	Max.digging depth	mm(in)	1790 (70.5)	1800 (70.9)	
	Max. lift above ground	mm(in)	1200 (47.2)	1140 (44.9)	
	HYDRAULIC CONTROL UNIT	kg(lb)	—	120 (260)	

1. COMPARISON BETWEEN THE MULTI-SHANK AND GIANT (SINGLE SHANK) RIPPERS

Multi-shank Ripper	Giant Ripper
M-1 Three tips provide high efficency ripping of soft rocks	G-1 Rigid construction. Suitable for harder rocks.
M-2 Foot of cliffs or slopes can be ripped by using the left or right tip.	G-2 Push plate allows tandem ripping.
 M-3 Adaptable to hard or soft rocks by increasing or decreasing the number of shanks	 G-3 Deep penetration and large distance from shank to rear or bulldozer make it possible to handle large rocks. G-4 Pin puller simplifies changing shank holes.

2. COMPARISON BETWEEN THE FIXED AND VARIABLE TYPE RIPPERS

Fixed-type Ripper	Variable-type Ripper
F-1 Simple construction and low price.	V-1 Digging angle can be adjusted to obtain optimum conditions for type of rock and slope of ground.
F-2 Constant digging angle.	V-2 Digs out boulders easily.
F-3 Simple hydraulic circuit means fewer oil leaks.	V-3 Tilting function makes it possible to cut roots.

Not all material can be ripped. Whether or not a rock can be ripped can be determined by any of the following methods:

(1) By the type of rock
(2) By an indoor rock test
(3) By a field rock test
(4) By a digging test with the ripper in the field.

Method (4) is most effective. If the user has no experience in ripping, you should demonstrate an actual ripping operation for him. Methods (1) and (3) are described below:

○Determination of ripability by type of rock

Rocks, are classified into sedimentary (aqueous), igneous, and metamorphic. The following general rules apply:

(1) Sedimentary rocks such as sandstone, limestone, and shale can be ripped easily. Sedimentary rocks are usually found stratified in layers which vary in thickness. The thinner the layers, the easier it is to rip them.

(2) Igneous rocks such as granite, basalt, and andesite are not found in distinct layers or cleavage planes, and this makes them difficult to rip.

(3) Metamorphic rocks such as gneiss, schist, and quartzite vary in ripability according to the degree of stratification or cleavage.

Ripability depends not only on the type of rock, but also on the degree of weathering or fracturing. Characteristics which determine the ease of ripability are summarized below.

●Favorable rock for ripping

- — Stratified
- —Weathered
- —Brittle, crystalline nature
- —High degree of laminations or thin layers.
- —Fractured
- —Faults or planes of weakness.

●Unfavorable rock for ripping

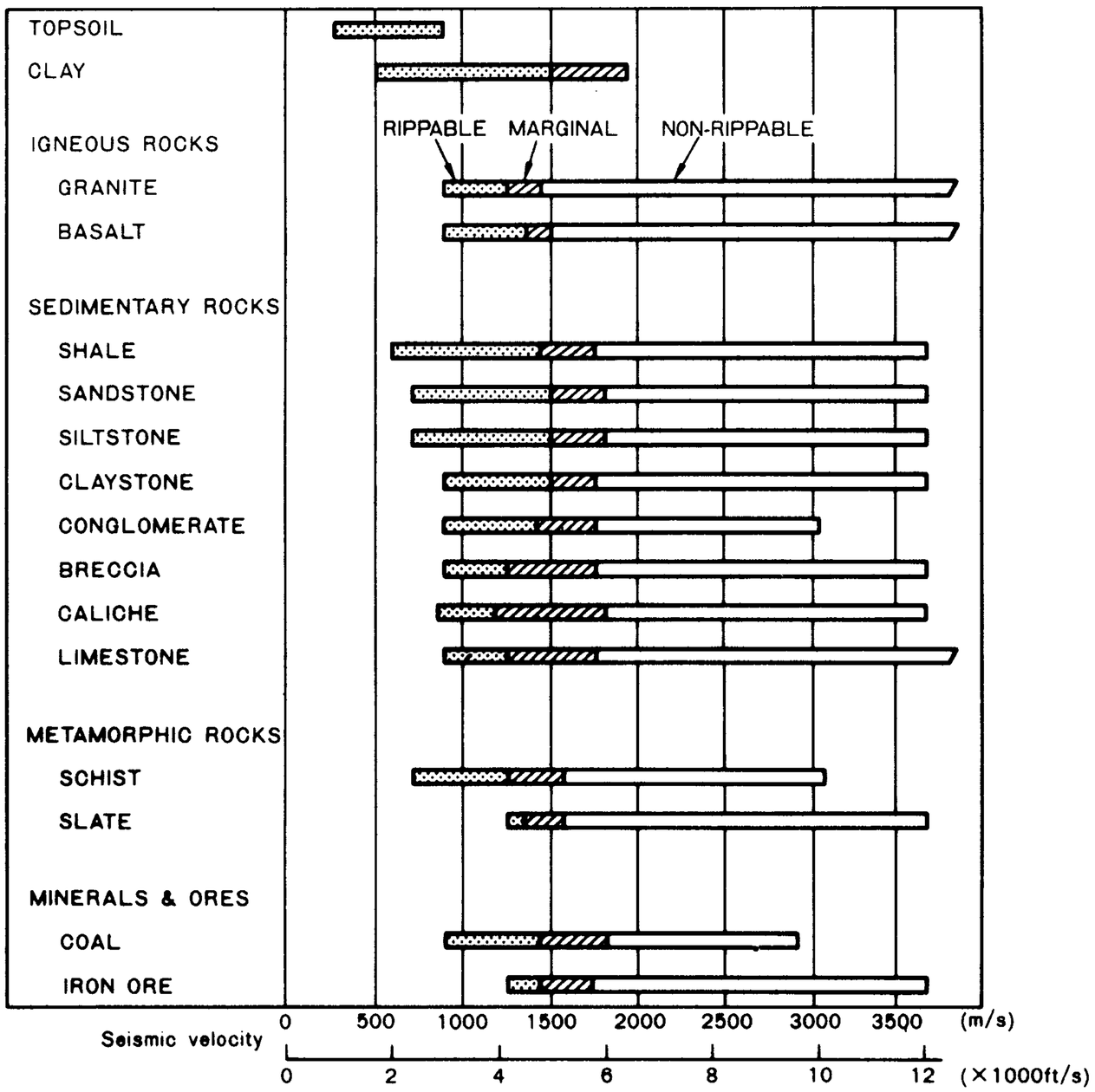
- —Fine-grained with a solid cementing agent.
- —Moisture, which tends to solidify the rock surface layer.
- —Lacking planes of weakness
- —Massive and homogeneous
- —Non-crystalline and not brittle

○Determination of ripability by in-the-field rock test.

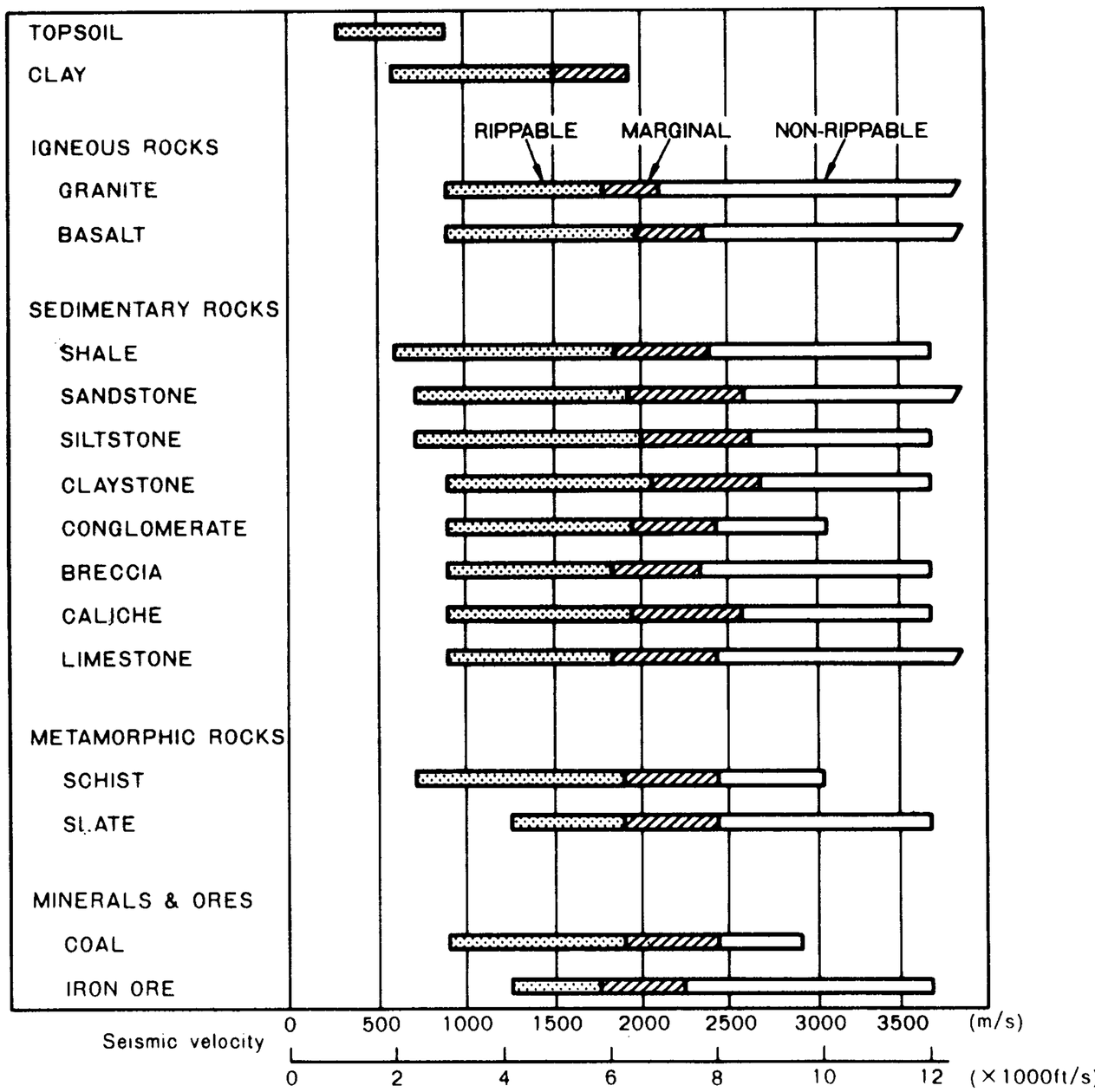
Seismic wave velocity tests are used to estimate the ripability of rock. In this test, an artificial earthquake is introduced and the travel speeds of seismic waves through different kinds of sub-surface materials are measured. Thus the degree of consolidation, thickness of sub-surface layers, hardness, degree of fracturing, stratification, and weathering can be determined.

The chart below compares ripper performance to seismic velocities. It should be used as only a rough guide, because ripper performance is subject to many other conditions.

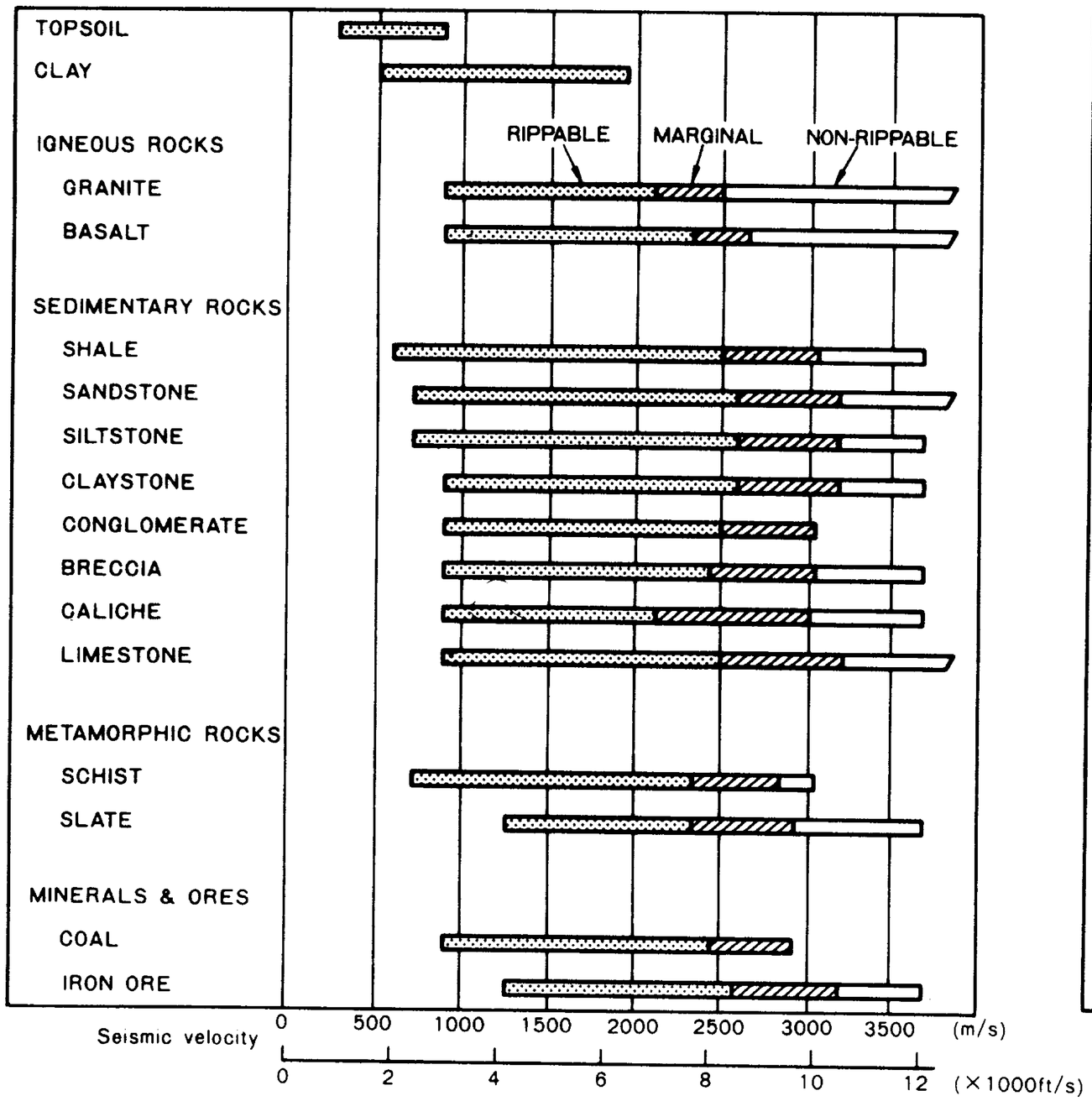
D80, D85 MULTI-SHANK Ripper (Single shank)



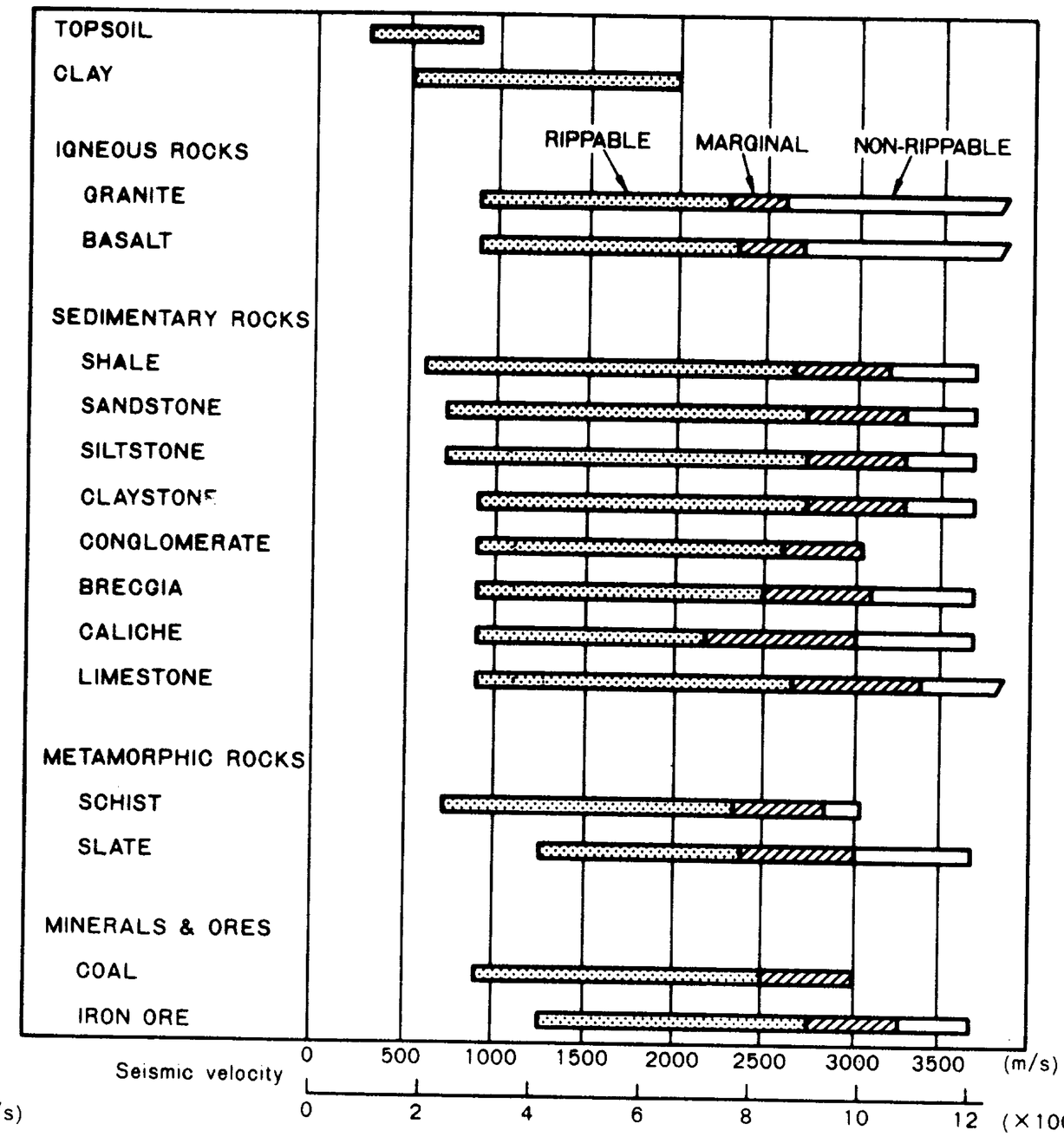
D155A Giant Ripper



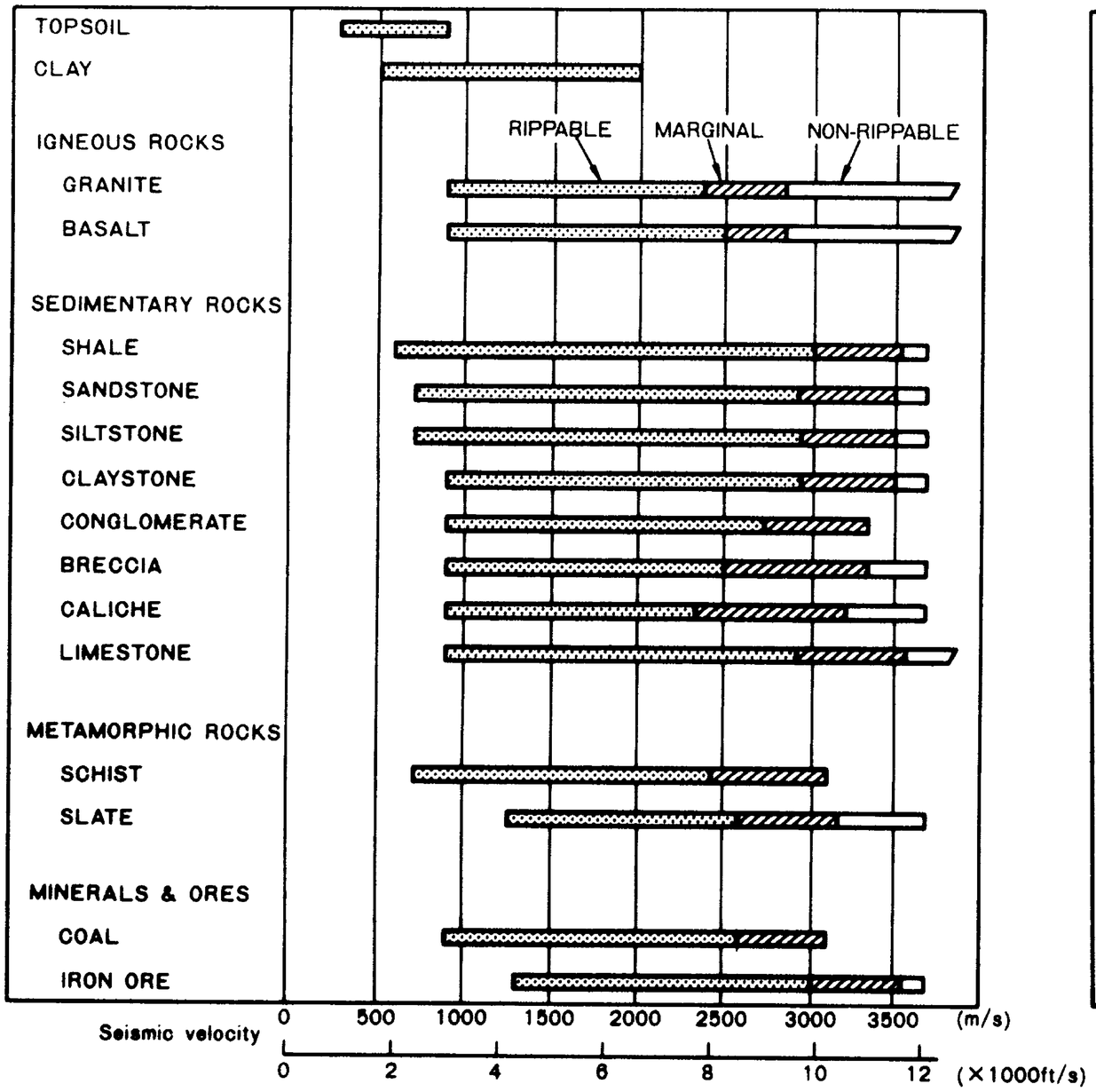
D355A Giant Ripper



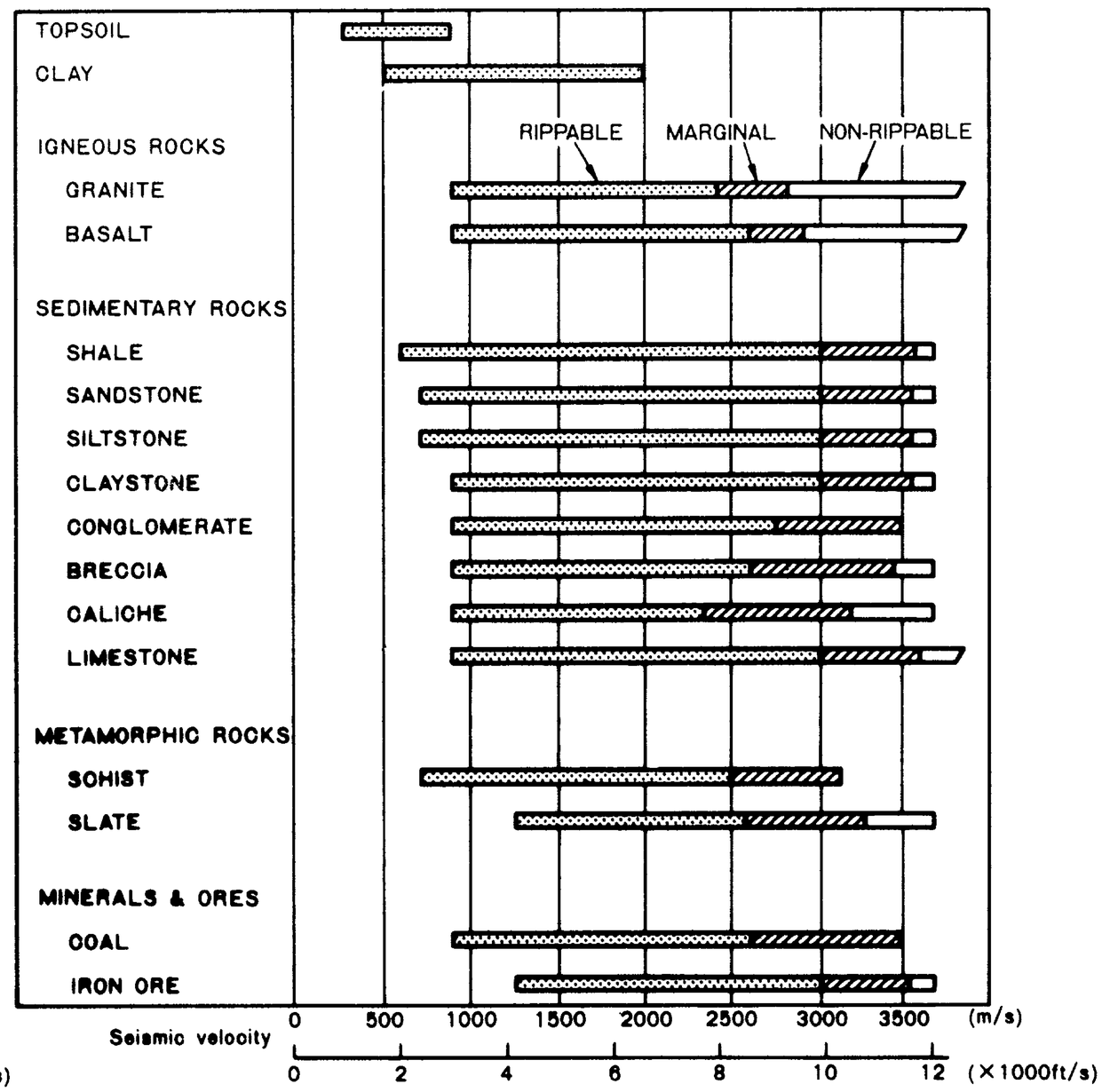
D375A Giant Ripper



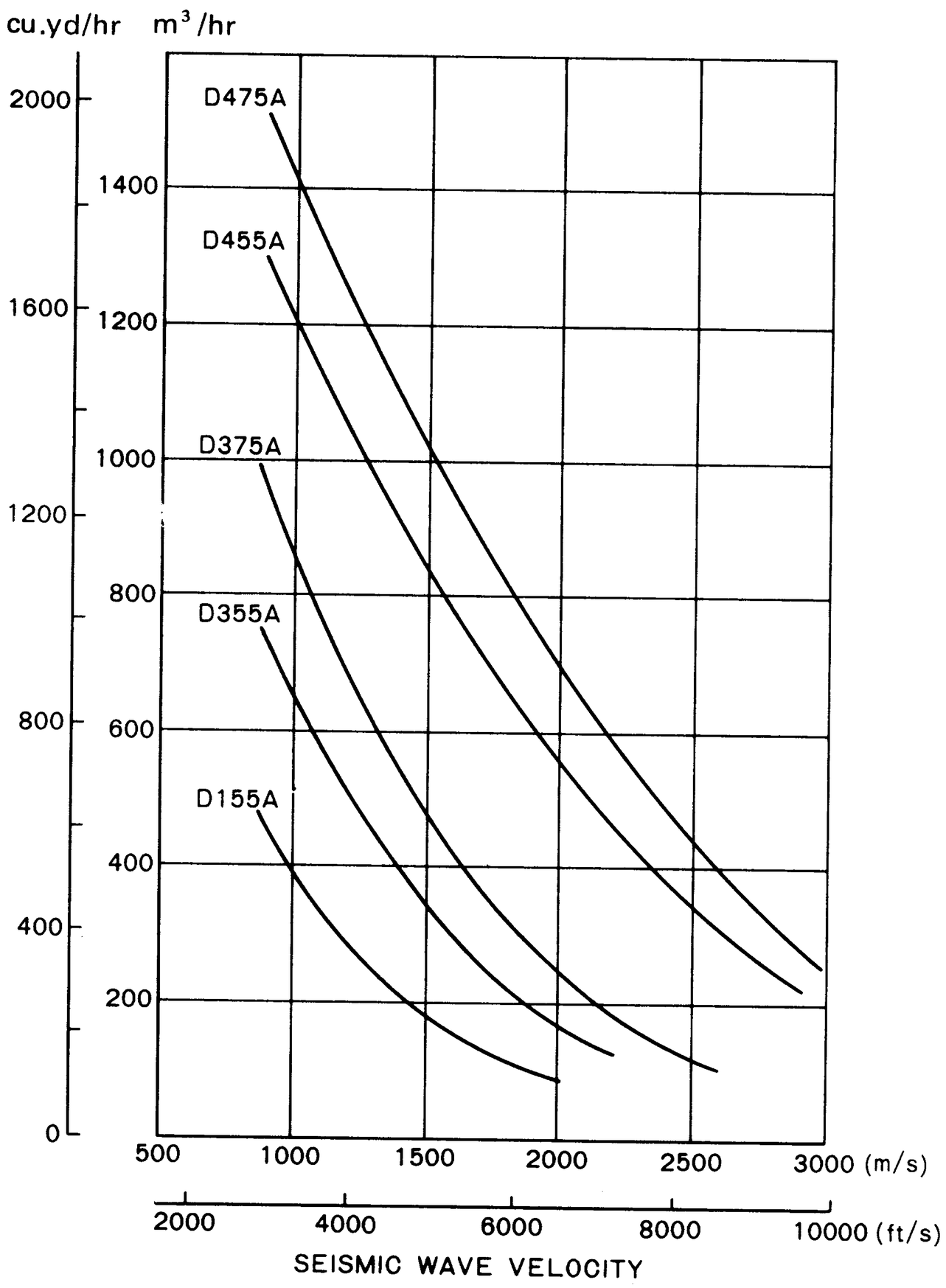
D455A Giant Ripper



D475A Giant Ripper



Since ripper performance varies considerably with the characteristics of the rocks, the work methods, and operator's skill, it is impossible to estimate performance accurately. However, based on accumulated data, the relationship between seismic wave velocity and production can be estimated roughly as shown in the graph. This graph applies only to ripping operations. Production is given in bank.



Note: This graph is based on numerous field studies.

Actual production = (Standard production) x (Job efficiency)

Job Efficiency (E)

Operation conditions	E
Good	0.75
Average	0.58
Rather poor	0.50
Poor	0.40

Conditions

1. Ripping production only
2. Bulldozers with single shank rippers
3. 100% job efficiency