COMITATO PER L'OMOLOGAZIONE
DELLE MACCHINE AGRICOLE

Report No. 527

REPORT ON TEST IN ACCORDANCE WITH O.E.C.D. TEST
CODE FOR AGRICULTURAL TRACTORS OF:

PASQUALI 996 DIESEL TRACTOR



Manufactured by: PASQUALI MACCHINE AGRICOLE S.p.A.
Works of CALENZANO (Firenze) - Italy

Date of tests: October-November 1975

This report has been approved by the O.E.C.D. Coordinating Centre (C.N.E.E.M.A., France) as being in accordance with the O.E.C.D. Tractor Test Code

Date of approval: 18th August 1976

CONSIGLIO NAZIONALE DELLE RICERCHE
LABORATORIO PER LA MECCANIZZAZIONE AGRICOLA
TORINO - ITALY

This bulletin is based on engineering tests in accordance with the O.E.C.D. Tractor Code. It does not contain an evaluation of the performance of the tractor on pratical farm work.

In this report all performance characteristics are given simultaneously according to the International System of Units (numbers enclosed in brackets).

The relation between the two systems is given by the following formulas:

Forces:	1 N	= 0.10197	kg	or 1	kg	= 9.80665	N
Powers:	1 kW	= 1.35962	metric hp	or 1	metric hp	= 0.73550	kW
Pressures:	1 bar	= 1.01972	kg/cm²	or 1	kg/cm²	= 0.980665	bar
Rotation speeds:	1 rd/s	= 9.54930	rev/min	or 1	rev/min	= 0.10472	rd/s
Torques:	1 mN	= 0.10197	mkg	or 1	mkg	= 9.80665	mN

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PERFORMANCE CURVES

FIG. No.

a) *Power take-off test*

Curves of power, torque, hourly and specific fuel consumption/ crankshaft speed 1

Curves of specific fuel consumption/crankshaft power p.t.o. 2

b) *Drawbar test*

Curves of drawbar power and wheelslip/drawbar pull (with ballast) . . 3

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Manufacturer:	PASQUALI MACCHINE AGRICOLE S.p.A. Works of CALENZANO (Firenze) - Italy
Submitted for test by:	The Manufacturer
Selected by:	The Manufacturer with the agreement of the testing station
Place of running-in:	Works of CALENZANO (Firenze) - Italy
Duration of running-in:	60 hours

SPECIFICATION OF TRACTOR

Tractor

Make:	PASQUALI
Model:	996
Type:	Four wheel driven tractor, articulated construction
Serial No.:	236

Engine

Make:	Lombardini
Model:	LDA 672
Type:	4-stroke, direct injection diesel
Serial No.:	1058517
Cylinders:	2 cylinders, vertical, in-line, 95 mm bore × 95 mm stroke, capacity 1346 cm^3, compression ratio 17.5 : 1, overhead in-line valves, replaceable cast-iron dry cylinder liners.
Fuel system:	Forced feed; FISPA diaphragm-type fuel pump, SUP 75 model; FIAMM paper filter, FNA 32/01 model, replaceable cartridge element FIAMM 4043/2 model; capacity of fuel tank 15 litres; BOSCH injection pump, PFR2K70/324/2 model. Manufacturer's production setting 6.7 to 7.0 l/h at 314.2 rd/s (3000 rev/min) rated engine speed and 15 °C fuel temperature. FB injector, BLL 160 SL 30 model. Injector setting 205.9 ± 4.9 bar (210 ± 5 kg/cm^2).
Governor:	Lombardini make, mechanical type with centrifugal weights, separate from the injection pump. Governed range of engine speed: 104.7 rd/s to 335.1 rd/s (1000 to 3200 rev/min). Rated engine speed 314.2 rd/s (3000 rev/min).

Air cleaner:	FISPA main cleaner, 213243 model, oil bath type; oil capacity 0.5 litres; pre-cleaner centrifugal type, FISPA make, 2077.03 model; recommended oil viscosity SAE 30.
Lubrication system:	Forced feed from gear-type pump; FIAMM make filter, FOL 542-030 model, replaceable cartridge element; oil capacity 4.350 litres; recommended oil change period: 100 hours; cartridge change period: 200 hours; recommended oil viscosity: SAE 30.
Cooling system:	Air circulation type, activated by 10-blade, belt driven fan 201.2 mm dia.
Starting system:	Electrical, BOSCH starter motor, JD (R) model, 12 V.

Electrical system

Voltage:	12 V, negative earth.
Alternator:	DUCATI make, E 52-1156-54 model.
Battery:	One, VARTA make, 562-90 model; capacity 62 Ah.

Transmission

Clutch:	Own make, single dry plate type, pedal operated 194 mm dia.
Gearbox:	Own make, mechanical type with total 9 forward and 3 reverse speeds; the transmission consists of a 3 forward and 1 reverse speeds gear group in series with a 3 forward speeds sliding gear group; each of two gear groups are operated by own lever.
Rear axle, front axle and final drives:	Own make; crown wheel/pinion and bevel gear type differential in front and in the rear axle; spur gear final drives in front and in the rear axle; differential lock only in the front axle, hand lever operated.
Oil capacity:	Gearbox, front differential and front final drives 8 litres; rear differential and rear final drives 4 litres.
Oil change period:	1000 hours.
Recommendend oil viscosity:	SAE 140.

Gear of 1st group No.	*Combination of 2nd group*	*Number of engine revolutions for one revolution of driving wheels*	*Travelling speed (*) for 314.2 rd/s (3000 rev/min) at rated engine speed*	
			km/h	*m/s*
1		615.637	0.68	0.189
2	slow	390.675	1.07	0.297
3		183.778	2.28	0.633
1		229.814	1.82	0.506
2	intermediate	145.843	2.87	0.797
3		58.562	7.16	1.989
1		68.610	6.11	1.697
2	direct	37.164	11.28	3.133
3		17.483	23.99	6.664
1		266.358	1.57	0.436
2	reverse	99.439	4.22	1.172
3		25.339	16.55	4.597

* Calculated with rolling radius 371 mm according to manufacturer's specifications

Power take-off
(optional)

In centre-line at rear of tractor; proportional engine speed, not independent, manually engaged and clutch driven;
34.9 mm (1 3/8 in) dia according to ISO.
Standard, 6 spline; height above ground 280 mm.
Proportional engine speeds: 62.6 rd/s and 79.8 rd/s at 314.2 rd/s rated engine speed (598 and 762 rev/min at 3000 rev/min rated engine speed).
56.5 rd/s (540 rev/min) at 283.7 rd/s (2709 rev/min) and at 222.6 rd/s (2126 rev/min) engine speed.
Direction of rotation: anti-clockwise viewed facing driving end.

Belt pulley

None on the tractor tested.

Power lift

Own make; PASQUALI 990 model; fully independent hydraulic gear pump Hidroirma 6K/UP model.
Position central system.
Single acting ram cylinder.
Oil capacity 4 litres.
Three point linkage category 1 ISO R 730.
Recommended oil viscosity: SAE 30.
No oil tappings.

Drawbar None on the tractor tested

Hitch Height above ground to centre of clevis 320 mm; hitch hole: 28 mm dia, distance from rear axle 270 mm.
The installation of the hitch does not allow the installation of the optional p.t.o.

Steering Own make, mechanical type, worm gear box, operated by hand-wheel, working on center tractor pivot.

Brakes Own make; mechanical type with drums and expanding shoes, mounted on rear axle, pedal operated; parking brake hand-lever with ratchet, operating working brake system.

Driving wheels Two at front and two at rear; pneumatics «Tractor» 7.50-16 tyres, 2 ply rating, mounted on 5.50 F rims.
Maximum permissible weight on each tyre 360 kg at 0.78 bar (0.80 kg/cm²) pressure.
Track widths 0.67 mm and 0.87 mm, changed by reversing wheels.

Wheelbase: 1180 mm.

Lighting Electrical 12 V, according to italian regulation.

	Height above ground of centre cm	*Dimensions* cm	*Distance from outside edge of tractor to centre* cm
Head lights	72.0	12.5 x 8.0	41.5
Side lights (*)	72.0	12.5 x 8.0	41.5
Rear lights	86.5	7.0 x 4.0	24.0
Reflectors	91.0	5.5 dia	24.0

* In combination with head lights.

Number of grease points (whole tractor) 13

CONDITIONS DURING TEST

Weights Tractor weight without driver but with tank full.

	Front kg	*Rear* kg	*Total* kg
Without ballast	640	240	880
With ballast	740	340	1080

Ballast

	No. of weights	*Total weight kg (excluding water)*	*Water kg*
Front wheels	2	100	—
Rear wheels	2	100	—

Track width during test: Front 870 mm, rear 870 mm.

Overall dimensions

	Length m	*Width m*		*Height m*
		max.	*min.*	
Without ballast	2.79	1.07	0.87	1.08
With ballast	2.79	1.07	0.87	1.08

Remarks:
- length measured from engine crowling to lower link in horizontal position;
- height measured to top of steering wheel;
- ground clearance 0.25 m (measured at differential).

Seat

Own make; upholstered mould with back rest without suspension and adjustements.

FUEL AND LUBRICANTS USED IN TESTS

Laboratory and track tests

Fuel: Diesel oil density 0.831 kg/l at 15 °C, cetane number not recorded.

Engine oil: AGIP F1, viscosity SAE 30

Transmission oil: AGIP F1, viscosity SAE 140

Hydraulic oil: AGIP F1, OSO 55, viscosity SAE 30

COMPULSORY TESTS

1. Power take-off performance

Date and location of test: 30th October 1975 - L.M.A. TURIN - Italy
Type of dynamometer: Electrical, swinging frame.

Power	Speed		Fuel consumption			Specific energy
	Engine	p.t.o.	Total		Specific	
kW (metric hp)	rd/s (rev/min)	rd/s (rev/min)	l/h	kg/h	g/kWh (g/metric hph)	kWh/l (metric hph/l
A - AT MAXIMUM POWER: 2 hour test						
18.2 (24.80)	314.2 (3000)	62.6 (598)	6.94	5.77	317 (234)	2.62 (3.57)
B - AT STANDARD p.t.o. SPEED - 56.5 rd/s (540 rev/min)						
17.1 (23.22)	283.5 (2709)	56.5 (540)	6.35	5.28	309 (227)	2.69 (3.66)
C - AT THE SPEED RECOMMENDED BY MANUFACTURER FOR DRAWBAR WORK						
18.2 (24.80)	314.2 (3000)	62.6 (598)	6.94	5.77	317 (234)	2.62 (3.57)
D - AT PART LOADS						
(i) 85% of the torque at maximum power						
15.8 (21.54)	321.0 (3065)	64.0 (611)	5.92	4.92	311 (228)	2.67 (3.64)
(ii) unloaded						
— —	330.1 (3150)	— —	2.45	2.04	— —	— —
(iii) 50% of the load defined in (i)						
8.0 (10.85)	323.0 (3085)	64.4 (615)	3.61	3.00	375 (276)	2.22 (3.01)
(iv) maximum power						
18.2 (24.80)	314.2 (3000)	62.6 (598)	6.94	5.77	317 (234)	2.62 (3.57)
(v) 25% of the load defined in (i)						
4.0 (5.48)	326.5 (3120)	65.1 (622)	2.74	2.28	570 (416)	1.46 (2.00)
(vi) 75% of the load defined in (i)						
11.9 (16.21)	322.0 (3075)	64.2 (613)	4.62	3.84	323 (237)	2.58 (3.51)

No load, maximum engine speed: 330.4 rd/s (3155 rev/min)

Equivalent crankshaft torque at maximum power: 58.0 mN (5.92 mkg).

Maximum equivalent chankshaft torque: 61.9 mN (6.31 mkg) at 240.9 rd/s (2300 rev/min).

Mean atmospheric conditions:
temperature 19.5 °C
pressure 1000 mbar (750.5 mmHg)
relative humidity 80 %

Maximum temperature:
coolant 90 °C
engine oil 133 °C
fuel 24 °C
engine air intake 26 °C

2. Drawbar performance

Date of test: 5th - 10th and 11th November 1975
Type of thack: concrete
Height of draught line above the ground: 320 mm.

Gear	Travelling speed		Power	Drawbar pull	Engine speed	Wheelslip	Fuel consumption		Temperature			Atmospheric conditions		
							Specific energy	Specific consumpt.	Fuel	Coolant	Engine oil	Temperature	Relative humidity	Pressure
No.	km/h	m/s	kW (metric hp)	N (kg)	rd/s (rev/min)	%	kWh/l (m.hph/l)	g/kWh (g/m.hph)	°C	°C	°C	°C	%	mbar (mmHg)
1 - MAXIMUM POWER (ballasted)														
1 slow	0.61	0.17	1.9 (2.51)	10900 (1110)	329.9 (3150)	15.0	—	—	—	—	105	12.0	90.0	998.4 (748.8)
2 slow	0.97	0.27	2.9 (3.99)	10900 (1110)	328.7 (3139)	15.0	—	—	—	—	108	12.0	90.0	998.4 (748.8)
1 inter.	1.66	0.46	5.0 (6.79)	10850 (1105)	328.4 (3136)	14.9	—	—	—	—	108	14.0	76.0	998.0 (748.5)
3 slow	2.02	0.56	6.2 (8.38)	11000 (1120)	325.7 (3110)	15.0	—	—	—	—	110	14.0	76.0	998.0 (748.5)
2 inter.	2.56	0.71	7.7 (10.48)	10850 (1105)	324.2 (3096)	14.7	1.98 (2.69)	419 (308)	20.0	—	115	14.2	77.0	998.0 (748.5)
1 dir.	5.40	1.50	16.0 (21.70)	10650 (1085)	318.9 (3045)	14.2	2.37 (3.21)	350 (259)	20.0	—	115	14.2	77.0	998.0 (748.5)
3 inter.	6.34	1.76	16.9 (23.01)	9600 (980)	314.5 (3003)	11.6	2.39 (3.25)	348 (256)	20.0	—	115	11.0	97.5	998.9 (749.2)
2 dir.	10.58	2.94	17.3 (23.51)	5900 (600)	314.6 (3004)	5.5	2.46 (3.34)	338 (249)	20.0	—	118	14.0	82.0	998.0 (748.5)
3 dir.	23.21	6.45	16.1 (21.92)	2590 (255)	313.3 (2992)	2.1	2.31 (3.14)	360 (265)	20.0	—	118	8.0	97.5	999.3 (749.5)
2 - FIVE HOUR TEST AT 75% OF PULL AT MAXIMUM POWER														
1 dir.	5.69	1.58	12.6 (17.18)	8000 (815)	322.3 (3078)	8.8	2.31 (3.14)	360 (265)	20.0	—	120	6.0	94.0	992.0 (744.0)
3 - FIVE HOUR TEST AT PULL CORRESPONDING TO 15% WEELSLIP IN TEST (1)														
2 inter.	—	—	—	10900 (1110)	323.4 (3088)	—	—	—	20.0	—	120	6.5	92.0	992.0 (744.0)
4 - MAXIMUM POWER (unballasted)														
1 dir.	5.33	1.48	14.2 (19.35)	9600 (980)	319.2 (3049)	14.8	2.50 (3.41)	332 (294)	20.0	—	115	7.5	78.5	995.0 (746.3)
3 inter.	6.16	1.71	16.4 (22.36)	9600 (980)	313.8 (2997)	15.0	2.34 (3.19)	355 (260)	20.0	—	118	7.5	78.5	995.0 (746.3)
2 dir.	10.51	2.92	17.5 (23.74)	6000 (610)	315.1 (3009)	6.2	2.51 (3.41)	331 (243)	20.0	—	122	2.0	95.5	996.2 (747.2)
3 dir.	23.15	6.43	16.7 (22.72)	2600 (265)	314.2 (3000)	2.6	2.34 (3.18)	355 (261)	20.0	—	122	13.8	75.0	994.6 (746.0)

Total oil consumption during ten hours of tests (2) and (3): 25 g/h
(1) Those figures not quoted are irrelevant due to the additional ballast.

3. Turning space and turning circle

Wheel equipment:	front 7.50-16 rear 7.50-16
Track of wheels:	front 870 mm rear 870 mm

	Without brakes (*)	
	Right-hand *m*	*Left-hand* *m*
Radius of turning space	2.30	2.21
Radius of turning circle	2.20	2.11

(*) Tractor unprovided with independent brake on each wheel.

4. Location of centre of gravity

Height above ground	mm	378
Distance forward from the vertical plane containing the axis of the rear wheels	mm	825
Distance from the median plane of the tractor	mm	0

5. Braking

Date of test:	11th November 1975
Type of track:	concrete
Type of decelerometer:	MOTO METER
Weight of tractor with driver:	with ballast 1150 kg without ballast 950 kg

Cold brakes

		With ballast	*Without ballast*
Travelling speed of tractor	km/h	25.0	25.0
Max. deceleration	m/s^2	3.10	3.30
Stopping distance	m	9.10	8.50
Force exerted on the brake pedal	N (kg)	460.9 (47)	509.9 (52)
Force exerted on the brake pedal to achieve a deceleration of 2.5 m/s^2	N (kg)	372.7 (38)	372.7 (38)

Brake fade characteristics (hot tests)

[Maximum deceleration hot/maximum deceleration cold] x 100	94%
[Stopping distance cold/stopping distance hot] x 100	92%
[Force on pedal cold/force on pedal hot] x 100	102%

Parking brake

Efficiency of handbrake on a slope of 16 per cent: with a 235.4 N (24 kg) pull on handbrake no wheel rotation occurs with tractor facing first up and then down the slope.

6. Measurement of ambient noise emitted by the tractor

Date of test:	11th November 1975
Type of sound level meter:	BRUEL & KJAER 2209 model
Type of track:	concrete
Position of the exhaust:	vertical

Results of test

— gear:	3rd direct
— travelling speed before acceleration:	17.81 km/h
— sound level:	97 dBA

7. Noise measurement at the driver's ear level

Date of test:	11th November 1975
Type of sound level meter and octave filter:	BRUEL & KJAER 2209 model and 1613 model
Type of track:	concrete
Type of frequency analyzer:	octave type, with 10 bands from 31.5 to 16.000 Hz.

Results of test

Gear	*Travelling speed km/h*	*Sound level*	
		dB (A)	*Sones*
3rd inter. (*)	7.16	102	146

(*) The gear tested corresponds to the travelling speed nearest to 7.25 km/h.

Remarks: No cab or frame fitted on tractor.

8. Power lift and hydraulic pump performance

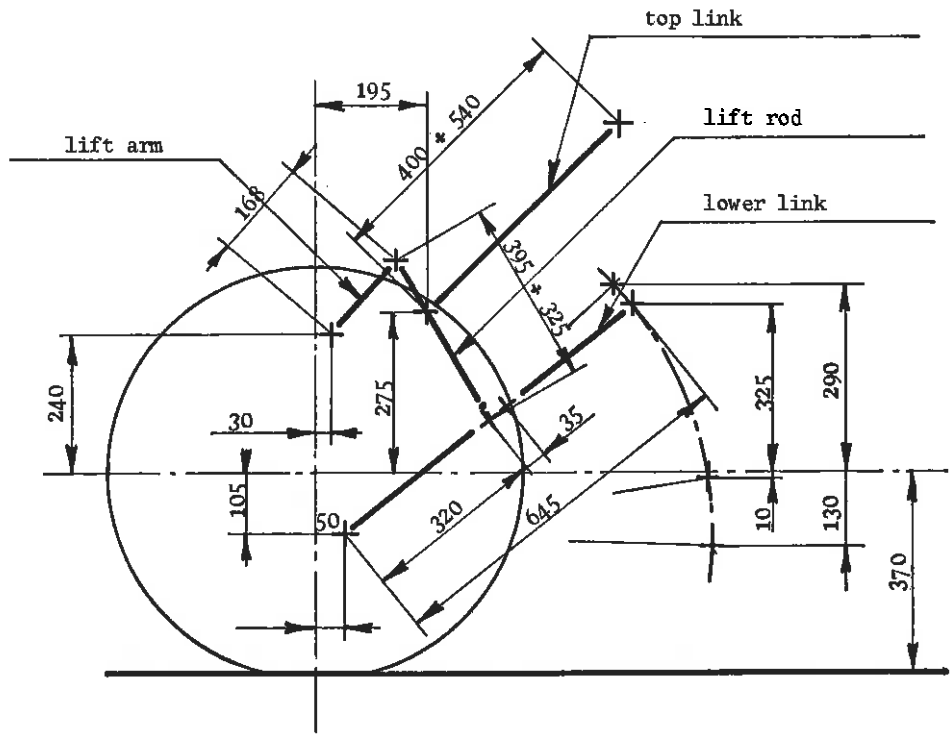
Date of test:	11th November 1975
Hydraulic fluid:	AGIP F1 OSO 55, viscosity SAE 30

Pump characteristics

1 - opening pressure of the relief valve:	98.1 bar (100 kg/cm²)
- substained pressure by the open relief valve:	117.7 bar (120 kg/cm²)
2 - pump delivery rate at minimum pressure and rated engine speed:	10 l/min
3 - pump delivery rate:	9.3 l/min
- delivery pressure:	98.1 bar (100 kg/cm²)
- hydraulic power:	1.52 kW (2.07 metric hp).

Power lift

Dimensions of linkage geometry for the table on page 12.



LINKAGE GEOMETRY WHEN CONNECTED TO THE STANDARD FRAME

	Maximum mechanical advantage	*Minimum mechanical advantage*
Projected length in side view:		
— lower links mm	645	645
— lift arms mm	168	168
— lift rods mm	295	320
— top link mm	520	507
Distance of lift rod connection point from pivot of lower link mm	345	345

The following dimensions are given relative to the rear axle centre line 370 mm above tthe ground level

Lower link pivot point	50 mm behind, 105 mm below	50 mm behind, 105 mm below
Top link pivot point	195 mm behind, 275 mm above	195 mm behind, 275 mm above
Lift arm pivot point	30 mm behind, 240 mm above	30 mm behind, 240 mm above
Maximum and minimum height of lower link hitch points	325 mm above, 10 mm below	290 mm above, 130 mm below
Height of lower link hitch points when locked in transport position	no lock for transport position	

LIFTING HEIGHTS IN RELATION TO A HORIZONTAL LINE THROUGH THE LOWER LINK PIVOTING POINT

		cm	— 3,3	— 2,5	0	+ 5	+ 9,5	+ 10	+ 15	+ 20	+ 25	+ 30	+ 35	+ 37	+ 40	+ 45	+ 50	+ 55	+ 60
Lifting force at hitch points	max. mech.	N	—	—	—	—	10300	—	10400	10600	11275	11525	11775	—	11875	—	—	—	—
	advantage	kg	—	—	—	—	(1050)	—	(1060)	(1080)	(1150)	(1175)	(1200)	—	(1210)	—	—	—	—
	min. mech.	N	—	7850	8150	8325	—	8575	9125	9800	10000	10250	10600	10775	—	—	—	—	—
	advantage	kg	—	(800)	(830)	(850)	—	(875)	(930)	(1000)	(1020)	(1045)	(1080)	(1100)	—	—	—	—	—
	Maximum force exerted through whole range: 10300 N (1050 kg)																		
	Force at which front of tractor is calculated to lift with maximum allowable front ballast: — N (— kg)																		
Lifting force at the frame	max. mech.	N	—	—	—	—	8250	—	8050	7850	7700	7650	7250	—	7050	6850	6775	6375	6025
	advantage	kg	—	—	—	—	(840)	—	(820)	(800)	(785)	(760)	(740)	—	(720)	(700)	(690)	(650)	(615)
	min. mech.	N	6825	—	6625	6575	—	6525	6425	6375	6375	6325	6275	—	6125	6025	5750	5400	—
	advantage	kg	(695)	—	(675)	(670)	—	(665)	(655)	(650)	(650)	(645)	(640)	—	(625)	(615)	(585)	(550)	—
	Maximum force exerted through whole range: 6025 N (615 kg)																		
	Force at which front of tractor is calculated to lift with maximum allowable front ballast: 6250 N (640 kg)																		

The lifting force values are worth for the pressure 98.1 bar (100 kg/cm2) at maximum hydraulic horsepower, calculated from measurements made at maximum pressure 177.7 bar (120 kg/cm2)

OFFICER IN CHARGE
(R. Gioia)

HEAD OF L.M.A.
(L. Lisa)

Turin, 4th February 1976

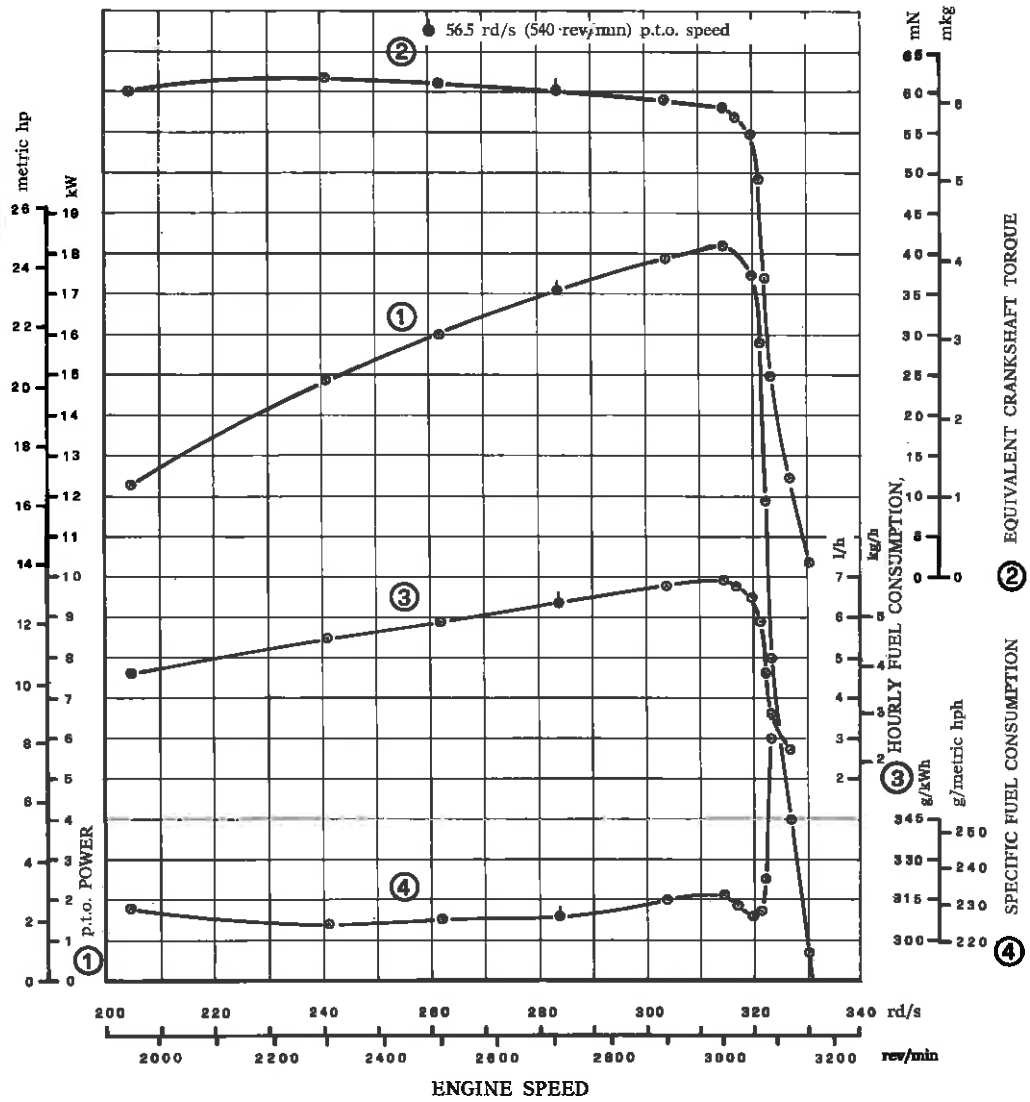


FIG. 1 - POWER TAKE-OFF TEST

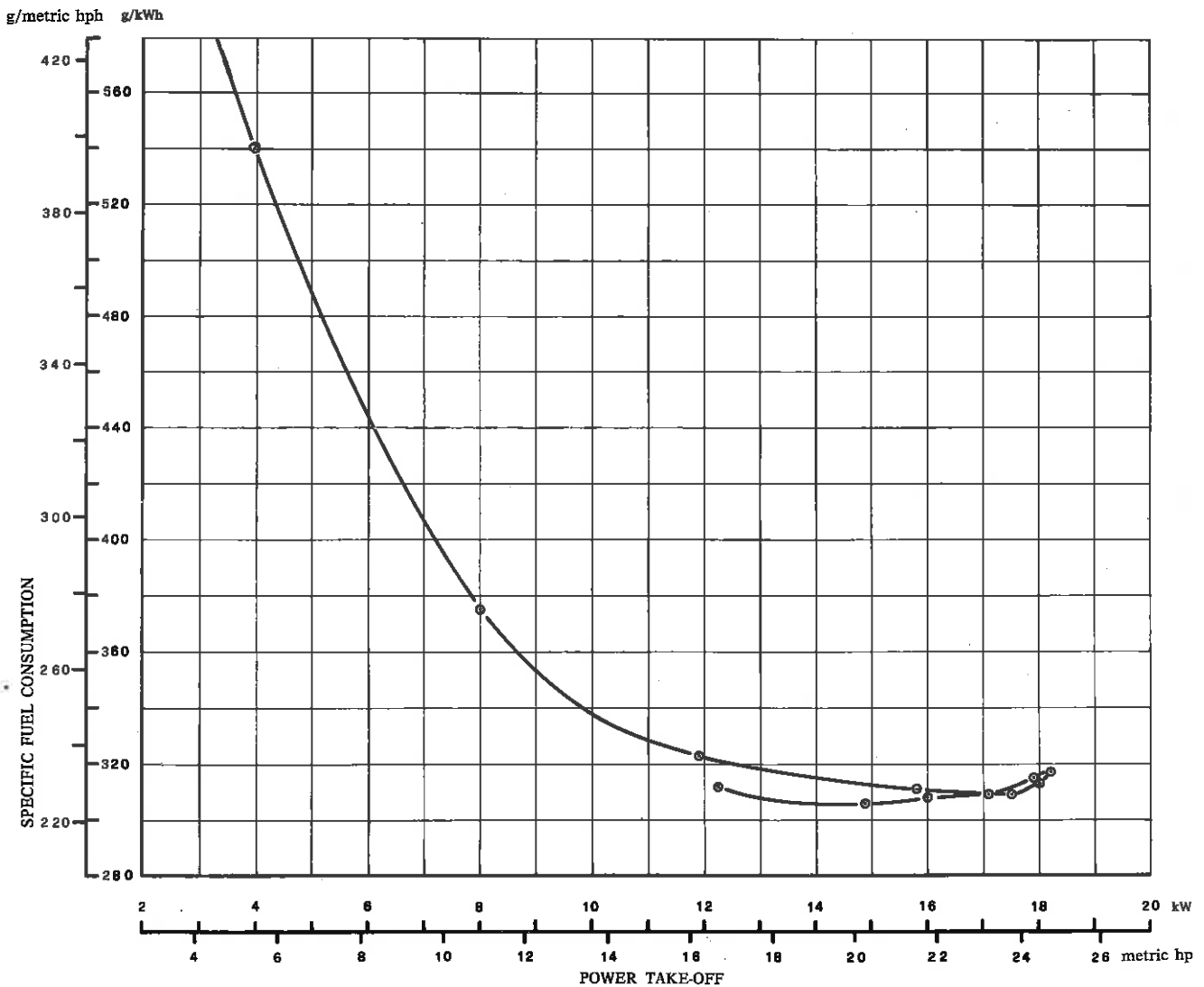


FIG. 2 - POWER TAKE-OFF TEST

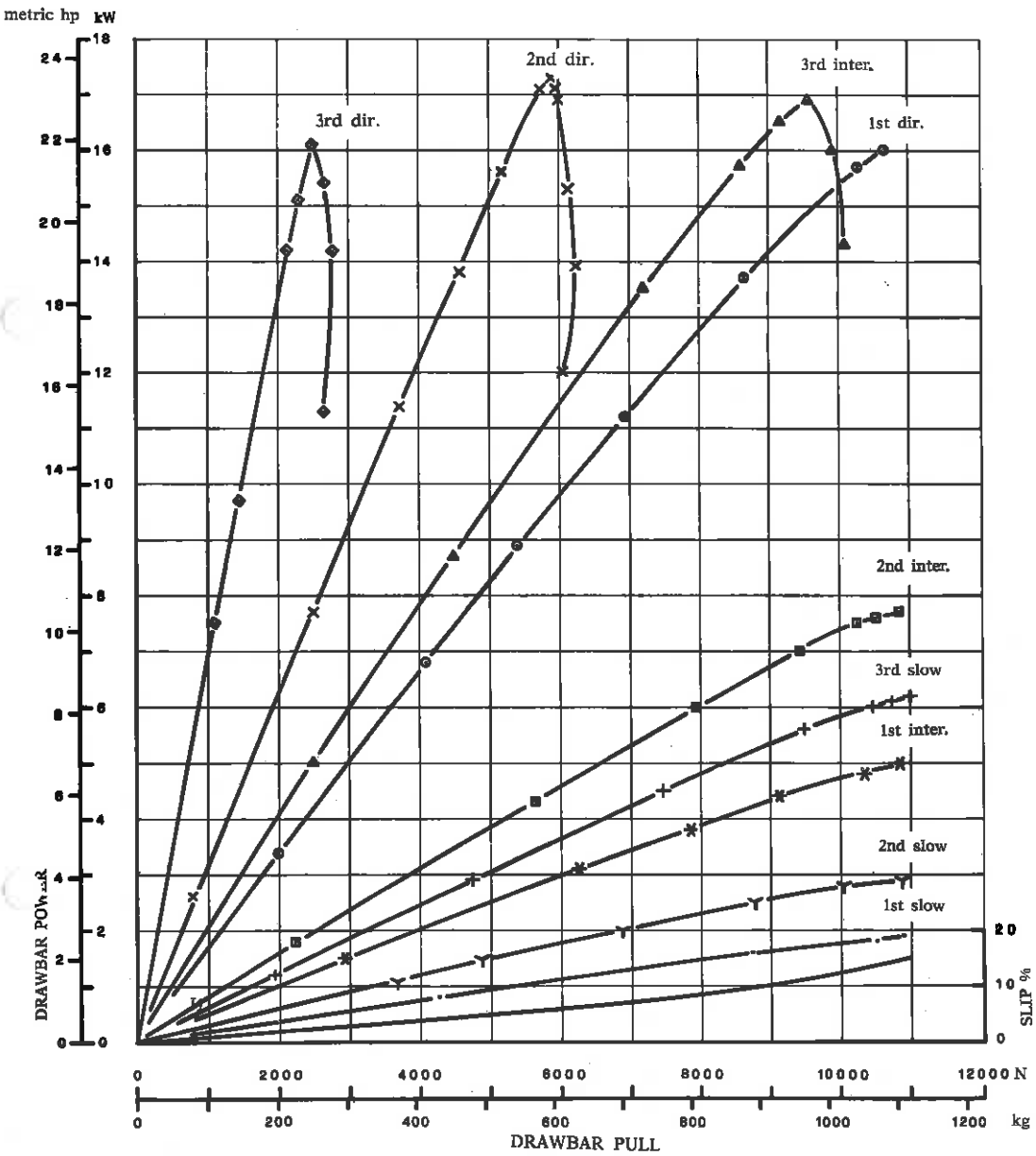


FIG. 3 - DRAWBAR TEST ON CONCRETE, WITH BALLAST

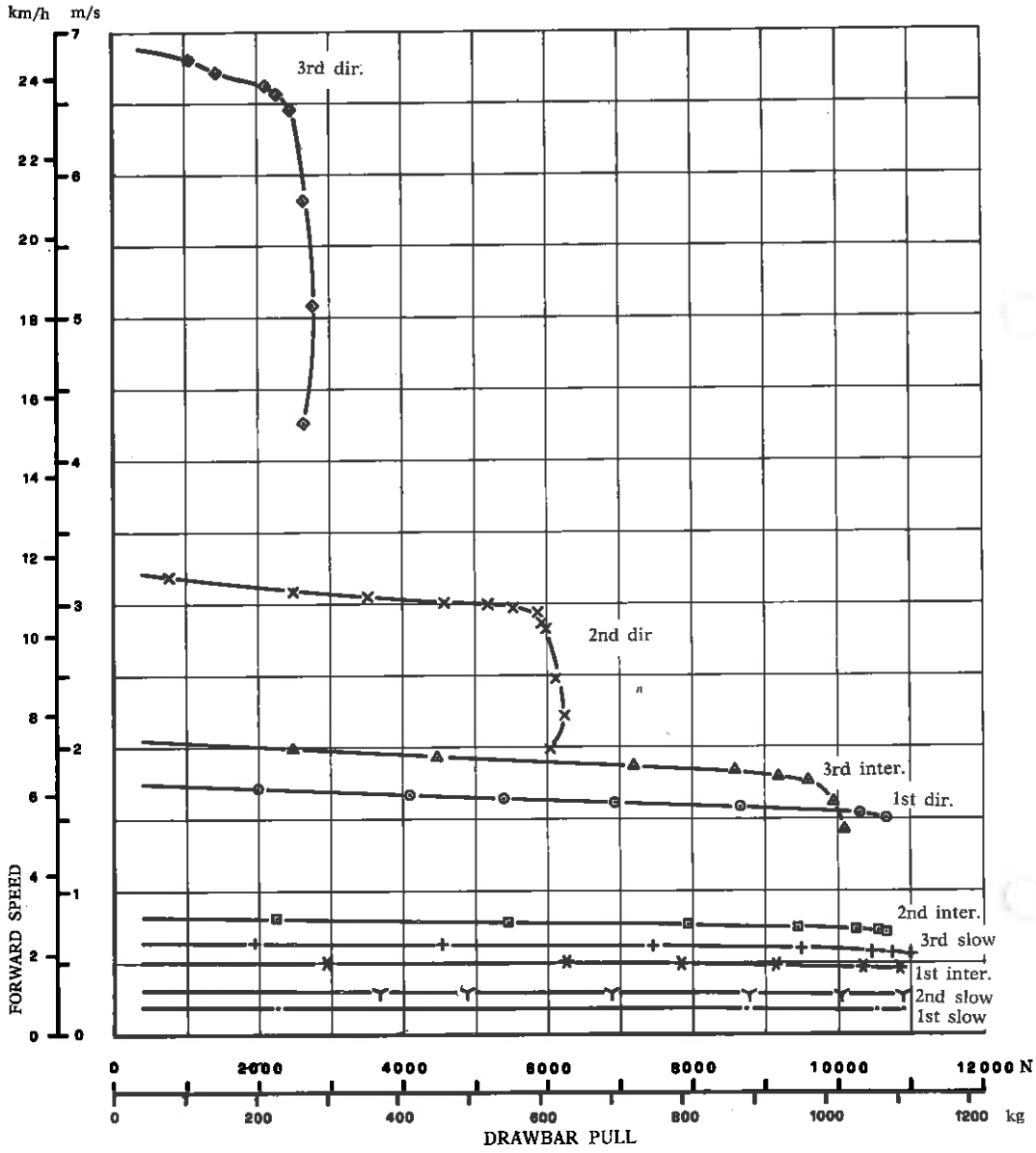


FIG. 4 - DRAWBAR TEST ON CONCRETE, WITH BALLAST

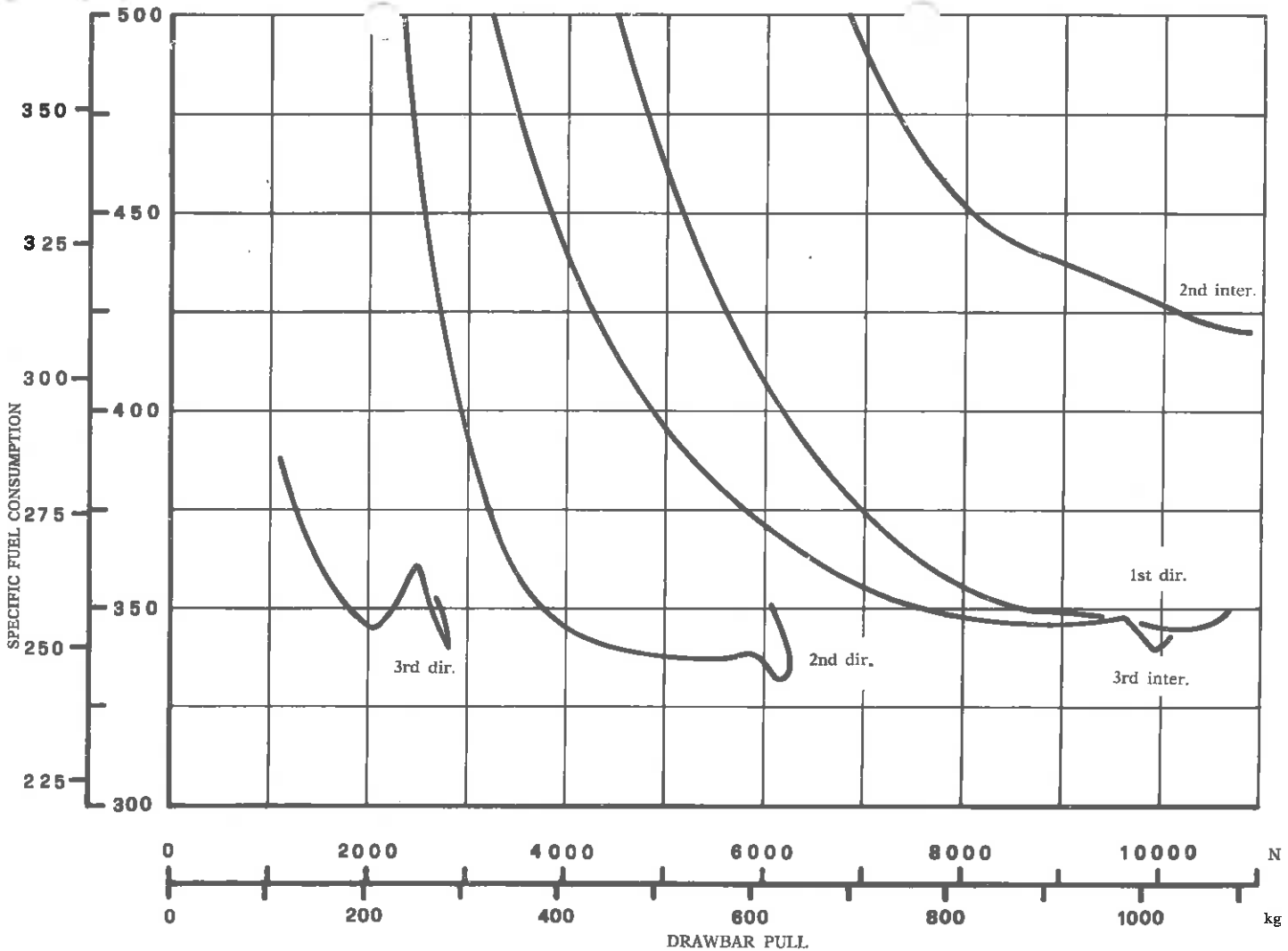


FIG. 5 - DRAWBAR TEST ON CONCRETE, WITHOUT BALLAST

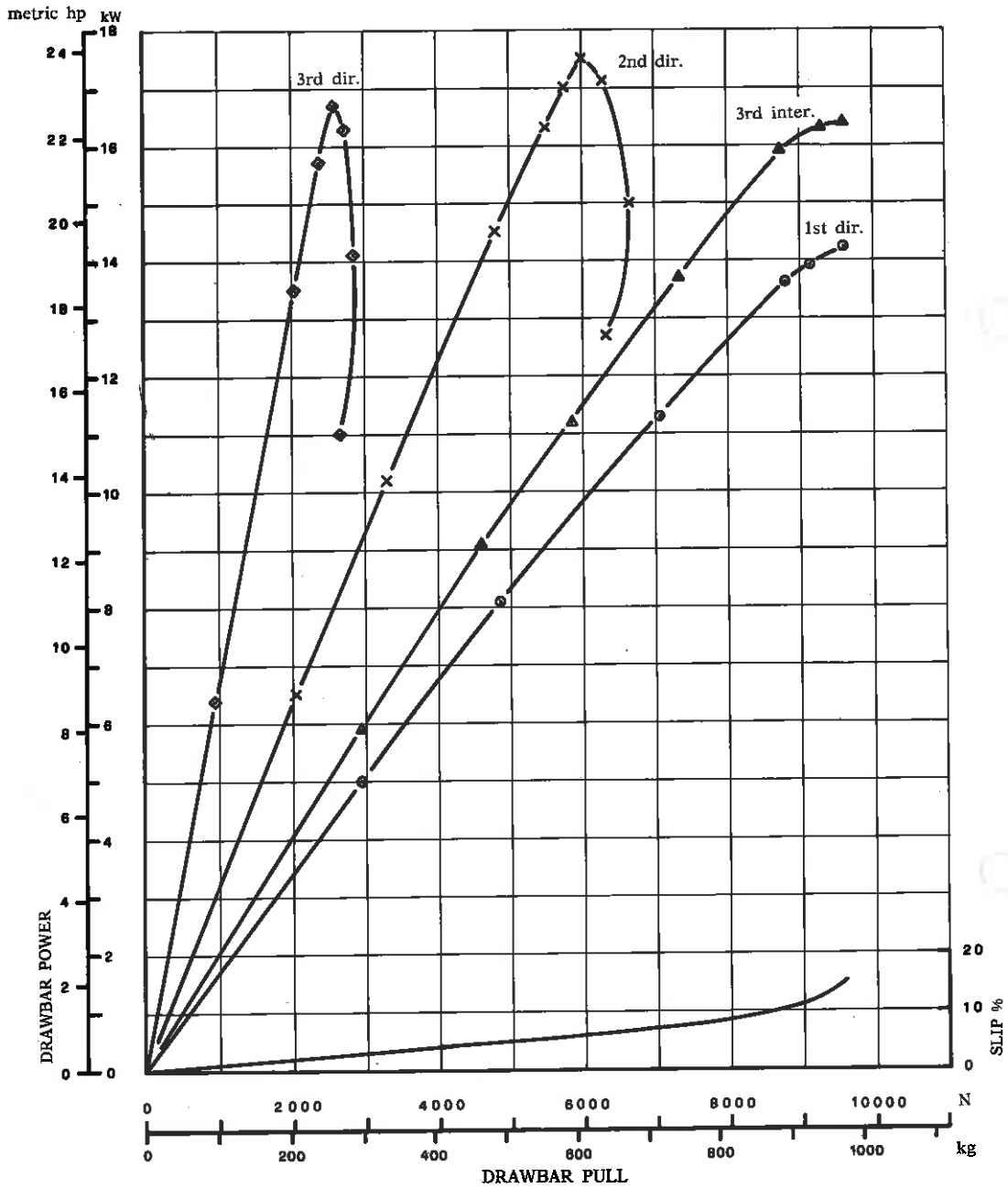


FIG. 6 - DRAWBAR TEST ON CONCRETE, WITHOUT BALLAST

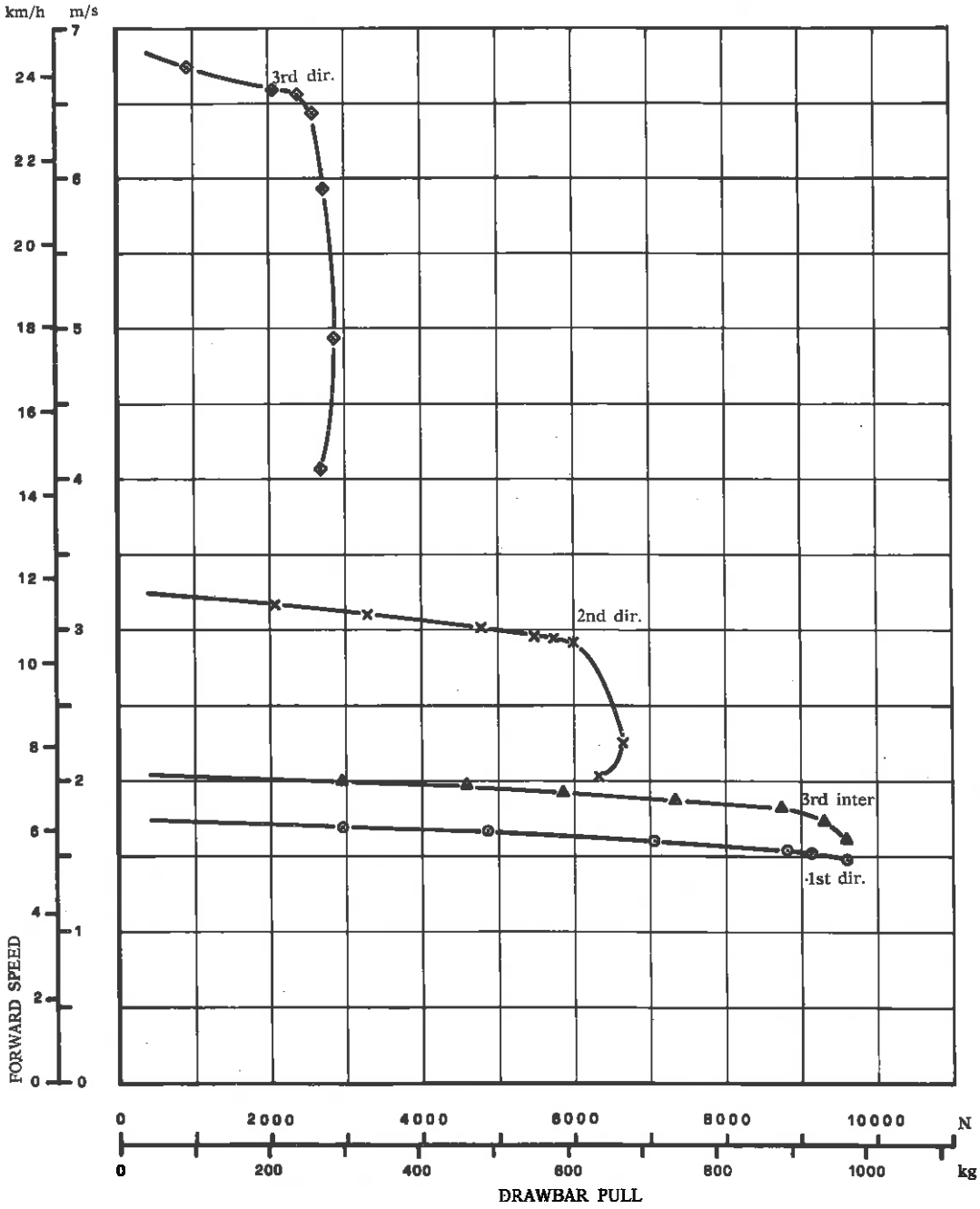


FIG. 7 - DRAWBAR TEST ON CONCRETE, WITHOUT BALLAST

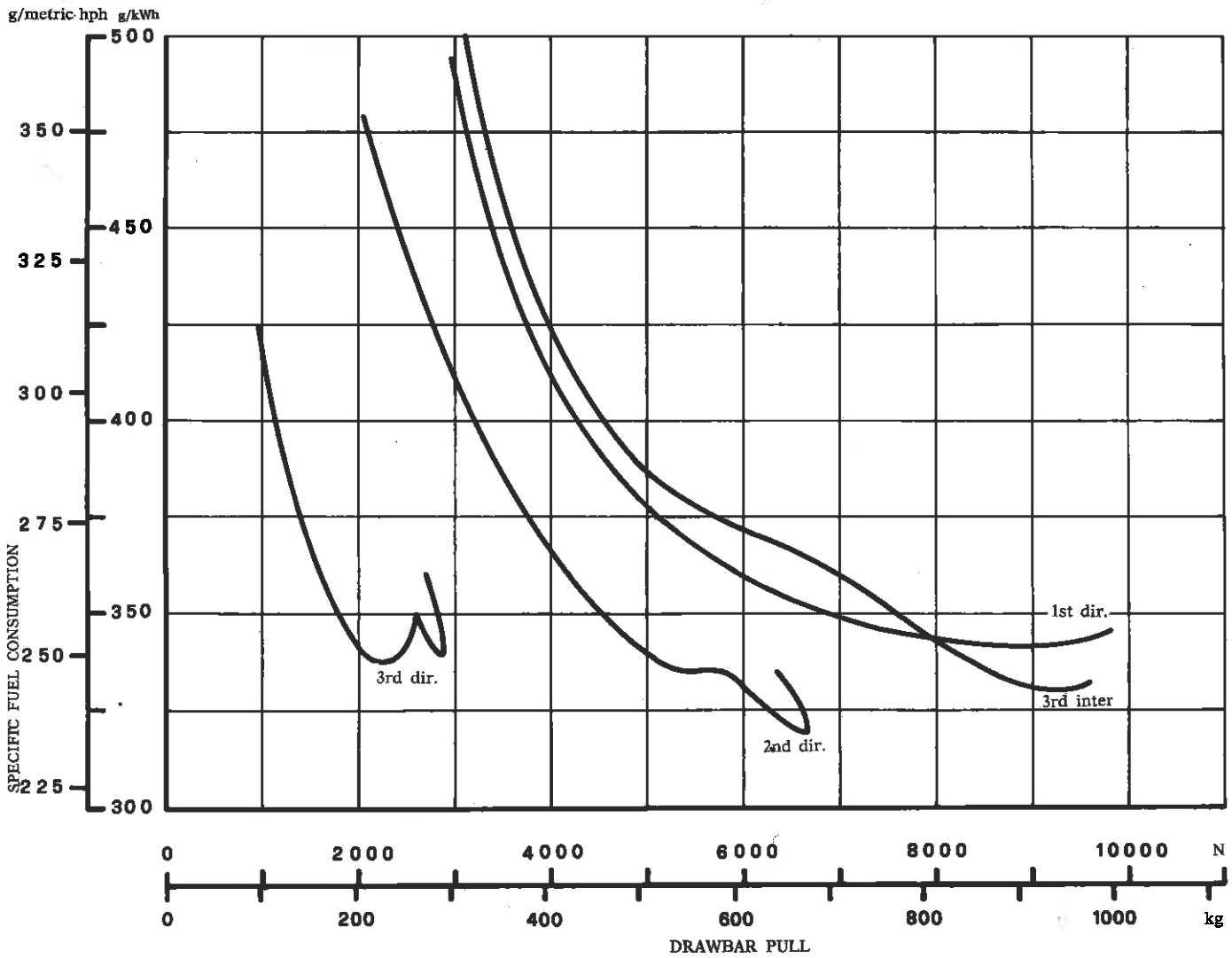


FIG. 8 - DRAWBAR TEST ON CONCRETE, WITHOUT BALLAST