an Ordner (OECD)

OECD Approval No. 953 Restricted Code

Test in accordance with the OECD restricted standard code for the official testing of agricultural tractors

Report on test of Ford 8210 Tractor

Manufactured by Ford Motor Company Limited,
Tractor Operations,
Cranes Farm Road,
Basildon, Essex. SS14 3AD.

Test No. R85/70447/OECD

Report No. 705

Date July 1985

THE BRITISH SOCIETY FOR RESEARCH IN AGRICULTURAL ENGINEERING

National Institute of Agricultural Engineering
Wrest Park Silsoe Bedford MK45 4HS

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Tractor manufacturer's name and address:	Ford Motor Company Limited Basildon Essex
Submitted for test by:	The manufacturer
Selected for test by:	The manufacturer with the agreement of the test station
Place of running in:	Basildon
Duration of running in:	24 hours

I. SPECIFICATION OF TRACTOR

TRACTOR	
Make:	Ford
Trade name:	Ford
Model:	8210
Type:	Four wheel drive, unit construction
Serial No:	BA 39546
First Serial No:	BA 13650
ENGINE	
Make:	Ford
Model:	8210
Type:	4-stroke, naturally aspirated, direct injection diesel
Serial No:	G822158
Cylinders	
Number/disposition:	6, vertical, in-line
Bore/stroke:	111.8 mm x 111.8 mm (4.4 in x 4.4 in)
Capacity:	6572 cm^3 (401 in^3)
Compression ratio:	16.3:1
Arrangement of valves:	Overhead
Cylinder liners:	None, monobloc construction
Fuel System	
Fuel feed system:	Lucas CAV mechanical feed pump
Make, type and model of fuel filter(s):	Plastic strainer in tank and CAV paper element filter with sediment bowl and water trap between tank and injection pump
Capacity of fuel tank:	178 l (39.2 UK gal)
Make, type and model of injection pump:	Lucas CAV in-line

Fuel System (contd.)

Serial No:	LB 05266
Manufacturer's production setting of injection pump:	20.4 kg/h (45 lb/h) minimum at 2300 rev/min engine speed on full load and 57-63°C (135-145°F) fuel temperature, using fuel of 0.85 specific gravity at 15°C (59°F)
Injection pump timing:	Delivery starts 27° before T.D.C.
Make, type and model of injectors:	CAV Multihole 5221910
Injection pressure:	19.4 - 20.0 MPa (191 - 197 atm)
Governor	
Make and type:	CAV mechanical incorporated in fuel injection pump
Governed range of engine speed:	750 to 2550 rev/min
Rated engine speed:	2300 rev/min
Air cleaner	
Make and type:	Locker air maze dry paper element 3-stage
Position:	Under engine cover forward of radiator
Maintenance indicator:	Warning light on instrument panel
Pre-cleaner	
Make and type:	Donaldson centrifugal
Position:	Above engine cover forward of radiator
Lubrication system	
Type of feed pump:	Force feed from eccentric rotor pump.
Type of filter(s):	Metal strainer in sump full flow replaceable paper element filter
Total oil capacity including filter(s):	19.0 l (33.4 UK pt)
Oil change period:	300 hours
Filter change period:	300 hours
Recommended oil:	See "Fuels and lubricants used in tests"

Cooling system

Type of coolant:	Water and antifreeze, 50% solution
Specification of pump	
Type:	Centrifugal impeller
Description of fan:	Belt driven
Number of fan blades:	6
Fan diameter:	483 mm (19.0 in)
Coolant capacity:	20.4 l (35.8 UK pt)
Type of temperature control:	Thermostat
Superpressure system:	50 kPa (7 lb/in^2)

Starting system

Safety device:	Operable only when clutch pedal is fully depressed
Make:	Lucas
Type:	Electrical, positive engagement, solenoid operated
Starter motor model and power rating:	M50G 12V, 2.8 kW (3.8 hp)
Cold starting aid:	Lucas CAV Thermostart

Electrical system

Voltage:	12
Generator:	Alternator
Make:	Motorola
Type:	Belt driven
Power:	72 A at 6000 rev/min
Batteries:	1, Ford lead-acid
Rating:	120 - 128 Ah at 20 hour rating

Exhaust system

Make:	Donaldson
Type:	Double chamber
Location:	Vertical above engine cover
Height of outlet above ground:	3064 mm (120.6 in)

TRANSMISSION

Clutch	
Make:	Borg and Beck
Type:	Dry, for transmission only
Number of plates:	1
Diameter of plate:	330 mm (13.0 in)
Method of operation:	Mechanically by pedal
Gearbox	
Make:	Ford
Type:	Mechanical, synchromesh
Arrangement:	4 forward speeds, with high/low and reverse range selector, planetary torque amplifier selectable on the move in forward and reverse gears
Number of speeds:	16 forward and 8 reverse
Available options:	None
Rear axle and final drives	
Make:	Ford
Type:	Crown wheel and pinion with differential and epicyclic reduction gear final drives
Differential lock	
Type:	Mechanical
Method of engagement:	Pedal operated
Method of disengagement:	Self disengaging
Front axle and final drives	
Make:	Z.F.
Type:	APL350 crown wheel and pinion with limited slip differential and epicyclic reduction gear final drives
Driven from:	Rear axle pinion shaft via spur gears and propellor shaft
Transmission oils	
Gear box, transmission and final drives	
Capacity	58.6 l (102.4 UK pt)
Change period:	1200 hours
Filter change period:	300 hours
Front axle	
Differential:	6.0 l (11.0 UK pt)
Final drives:	1.2 l (2.2 UK pt)
Change period:	1200 hours
Type of oil filter:	None
Recommended oil:	See "Fuels and lubricants used in tests"

Gear No	Group	Number of engine revolutions for one revolution of the driving wheels	Nominal travelling speed at rated engine speed: 2300 rev/min km/h	(mile/h)
Forward				
1	LM	276.38	2.57	(1.60)
1	L	214.96	3.31	(2.06)
2	LM	203.14	3.50	(2.17)
2	L	158.00	4.50	(2.80)
3	LM	151.31	4.70	(2.92)
3	L	117.69	6.04	(3.75)
4	LM	111.21	6.39	(3.97)
4	L	86.50	8.22	(5.11)
1	HM	78.23	9.09	(5.65)
1	H	60.84	11.68	(7.26)
2	HM	57.50	12.36	(7.68)
2	H	44.71	15.90	(9.88)
3	HM	42.83	16.60	(10.31)
3	H	33.31	21.34	(13.26)
4	HM	31.48	22.58	(14.03)
4	H	24.48	29.40	(18.27)
Reverse				
1	LM	213.98	3.32	(2.06)
1	L	166.43	4.27	(2.65)
2	LM	157.27	4.52	(2.81)
2	L	122.33	5.81	(3.61)
3	HM	117.15	6.07	(3.77)
3	H	91.12	7.80	(4.85)
4	HM	86.10	8.26	(5.13)
4	H	66.97	10.62	(6.60)

M = Torque amplifier engaged L = Low range H = High range

Rear tyre size: 18.4-38 Tyre loaded radius: 820 mm (32.3 in)

POWER TAKE-OFF

Main power take-off

Type:	Independent of main clutch
Method of engagement:	Lever and hydraulically operated, multi plate clutch
Number of shafts:	1
Method of changing power take-off speeds:	Manually, by exchanging shafts

Power take-off proportional to engine speed

(i) 540 rev/min

Location:	At rear of tractor
Diameter of power take-off shaft:	34.9 mm (1.375 in)
Number of splines:	6 to I.S.O. 500
Tyres:	Front, 14.9-28. Rear, 18.4-38
Height above ground:	753 mm (29.6 in)
Distance from the median plane of the tractor:	Central
Distance behind rear axle:	468 mm (18.4 in)
Pto speed at rated engine speed:	657 rev/min
Engine speed at standard power take-off speed:	1890 rev/min
Engine to pto ratio:	3.5 : 1
Power restriction:	ISO recommendation, 48 kW (64.3 hp)
Direction of rotation (viewed facing driving end):	Clockwise

(ii) 1000 rev/min

Location:	At rear of tractor
Diameter of power take-off shaft:	34.9 mm (1.375 in)
Number of splines:	21 to I.S.O. 500
Tyres:	Front, 14.9-28. Rear, 18.4-38
Height above ground:	753 mm (29.6 in)
Distance from the median plane of the tractor:	Central
Distance behind rear axle:	468 mm (18.4 in)
Pto speed at rated engine speed:	1122 rev/min
Engine speed at standard power take-off speed:	2049 rev/min
Engine to pto ratio:	2.049 : 1
Direction of rotation (viewed facing driving end):	Clockwise

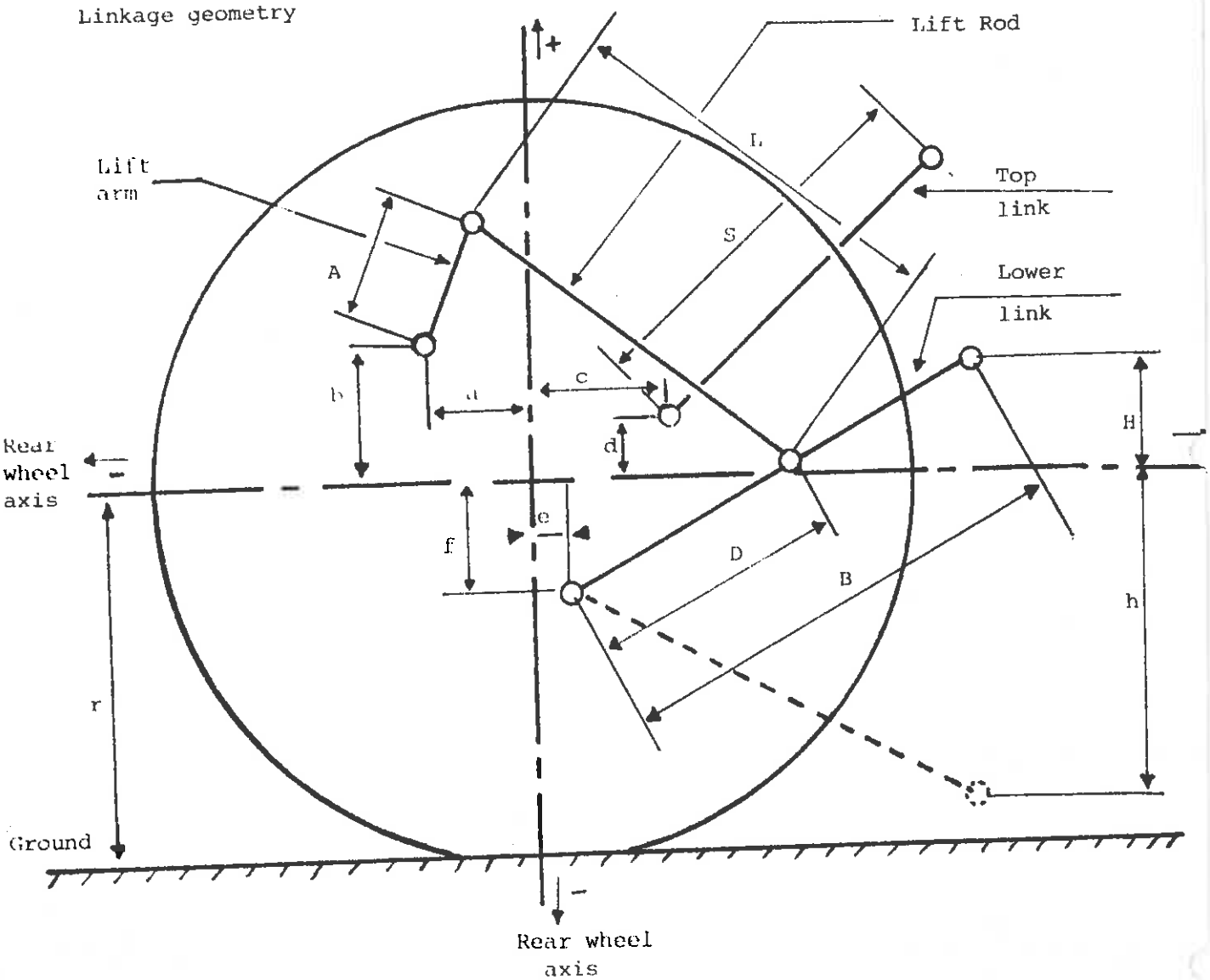
POWER LIFT

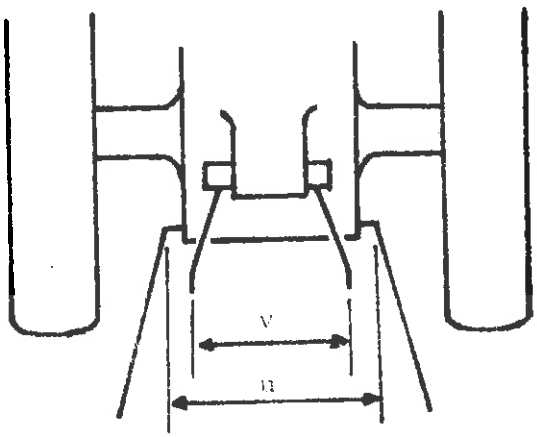
Make:	Ford
Type:	Hydraulic
Type and number of cylinders:	One internal single acting, one external single acting
Type of linkage lock for transport:	Hydraulic
Relief valve pressure setting:	17.6 - 18.3 MPa (2550 - 2650 lb/in^2)
Opening pressure of cylinder safety valve:	19.0 - 19.7 MPa (2750 - 2850 lb/in^2)
Lift pump type:	Sundstrand, live, gear
Transmission between pump and engine:	From pto shaft, independent of main and pto clutches
Make and number of filters:	1, Ford
Time between oil changes:	1200 hours
Time between filter changes:	300 hours
Oil capacity:	73.6 l (129.5 UK pt) Including additional fill for remote cylinders
Site of oil reservoir:	Rear axle housing
Type and number of tapping points:	2 remote cylinder/motor control valves and auxiliary service control
Maximum volume of oil available to external cylinders:	59.1 l (104.0 UK pt) with tractor on level ground
Recommended oil:	See "Fuels and lubricants used in tests"

THREE-POINT LINKAGE

Category:	2 to I.S.O. 730/1
Category adaptor:	None
Controls:	Draught or position control with top link and rear axle load monitor draught sensing

Linkage geometry





Linkage dimensions for the lifting test

Rear tyres (size 18.4-38) radius index:		(r)	820 mm	(32.3 in)
Front tyres (size 14.9-28) radius index:		(r')	640 mm	(25.2 in)
Length of lift arms:		(A)	229 mm	(9.0 in)
Length of lower links:		(B)	925 mm	(36.4 in)
Distance of lift arm pivot point from rear wheel centre line	horizontally:	(a)	102 mm	(4.0 in)
	vertically:	(b)	340 mm	(13.4 in)
Horizontal distance between the 2 lower link points:		(u)	514 mm	(20.2 in)
Horizontal distance between the 2 lift arm end points:		(v)	582 mm	(22.9 in)
Length of top link:		(S)	702 mm	(27.6 in)
Distance of top link pivot point from rear wheel centre line	horizontally:	(c)	337 mm	(13.3 in)
	vertically:	(d)	146 mm	(5.7 in)
Distance of lower link pivot point from rear wheel centre	horizontally:	(e)	102 mm	(4.0 in)
	vertically:	(f)	229 mm	(9.0 in)
Distance of lower link pivot points to lift rod pivot points on lower links:		(D)	520 mm	(20.5 in)
Length of lift rods:		(L)	885 mm	(34.8 in)
Height of lower hitch points relative to the rear wheel centre line, situated 820 mm above the ground level				
- in low position:		(h)	412 mm	(16.2 in)
- in high position:		(H)	254 mm	(10.0 in)
Height of lower hitch points when locked in transport position:		Any height within lift range		

SWINGING DRAWBAR

Rear tyres (size 18.4-38) radius index:	820 mm (32.3 in)
Front tyres (size 14.9-28) radius index:	640 mm (25.2 in)
Height above ground maximum:	550 mm (21.7 in)
minimum:	450 mm (17.7 in)
Type of adjustment:	Inverting drawbar
Distance of hitch point from rear wheel centre:	699 mm (27.5 in), 824 mm (32.4 in), 874 mm (34.4 in)
Distance of hitch point from power take-off shaft end:	
vertically:	203 mm (8.0 in), 303 mm (11.9 in)
horizontally:	231 mm (9.1 in), 356 mm (14.0 in) 406 mm (16.0 in)
Lateral adjustment:	406 mm (16.0 in), 483 mm (19.0 in) 508 mm (20.0 in)
Distance of pivot point from rear wheel centre horizontally:	On centre line
Diameter of drawbar pin holes:	27 mm (1.1 in)

TRAILER HITCH

Type:	Rear automatic pick-up hitch, adjustable height rear tow hook available, not fitted for test

STEERING

Method of operation:	Hydrostatic power system with hand operated steering motor powered by engine mounted gear pump operating a single, double-acting, balanced ram integral with front axle with a track rod connected to each end.
Pump:	Sundstrand gear pump with integral reservoir
Motor:	TRW Hydrostatic H.G.A. steering motor
Ram:	Z.P. Steering ram integral with axle case
Working pressure:	10.7 - 11.4 MPa (1550 - 1650 lb/in^2)
Oil capacity:	2.4 l (4.2 UK pt)
Oil change period:	1200 hours
Filter(s) change period	1200 hours
Recommended oil:	"See "Fuels and lubricants used in test"

BRAKES

Service brake

Make:	Girling
Type:	Oil immersed multi-plate discs, 4 per side
Method of operation:	Independent or combined pedal, mechanical linkage

Parking brake

Type:	Mechanical linkage coupled to both service brakes
Method of operation:	Hand lever with ratchet

Trailer brake	Hydraulic, none fitted

STEERING WHEELS

Number:	2
Location:	At front
Tyres:	Michelin
Size:	14.9 - 28 BIB X
Ply rating:	8
Type of casing:	Radial
Maximum permissible load on each tyre:	1925 kg (4244 lb)
Corresponding inflation pressure:	180 kPa (26 lb/in^2)
Track widths:	1542 mm (60.7 in) to 2030 mm (79.9 in)
Method of adjustment:	Reversing wheels and offset lug rims

DRIVING WHEELS

Number:	4
Location:	At the front and rear of tractor
Rear tyres:	Michelin
Size:	18.4 - 38 BIB X
Ply rating:	10
Type of casing:	Radial
Maximum permissible load on each tyre:	3210 kg (7077 lb)
Corresponding inflation pressure:	180 kPa (26 lb/in^2)
Track widths:	1524 mm (60 in) by 102 mm (4.0 in) steps to 2032 mm (80 in)
Method of adjustment:	Reversing wheels and offset lug rims

WHEELBASE	2790 mm (109.8 in)

PROTECTIVE STRUCTURE SPECIFICATIONS

OECD approval number:	CSD 0451/1-a(C)
Trade name:	Ford 'Q' Safety Cab
Manufacturer's name and address:	Ford Motor Company Basildon

Description:

A welded steel cab having hollow, folded and pressed section frame members with integral pressed sheet steel cladding, floor, seat mounting, fascia cowl, side panels, mudguards and a bolt-in rear cross brace. The cab is mounted on four anti-vibration mounts, the brackets for which are bolted to the tractor rear axle and to the clutch housing. An assister ram bracket may be fitted to the lower clamping plate of the left-hand mounting. The glass-reinforced plastics roof is bolted to the frame and incorporates a plenum chamber with air inlets and outlets for the heating and ventilating system and a roof hatch may be fitted. There are mounting steps and a door each side and the two-piece rear window and the side windows are hinged at their top edges and provided with telescopic struts. The roof, side panels, floor and fascia cowl are lined with sound absorbing and deadening materials.

DRIVER'S SEAT

Make:	Bostrom, Viking 301
Type of suspension:	Torsion bar
Type of damping:	Telescopic hydraulic damper adjustable for drivers weight
Range of adjustment, longitudinal:	120 mm (4.7 in)
vertical:	60 mm (2.4 in)

LIGHTING

Unrestricted beam angle of head light in plan view 130°

Tyres: front 14.9-28, rear 18.4-38

	Height above ground to centre, mm (in)	Size, mm (in)	Distance from outside edge of tractor to centre, at 1626 mm (64.0 in) track width, mm (in)
Headlights	1203 (47.4)	120 (4.7) dia	546 (21.5)
Sidelights	1721 (67.8)	70 (2.8) x 70 (2.8)	224 (8.8)
Rear lights	1744 (68.7)	70 (2.8) x 70 (2.8)	259 (10.2)
Reflectors	1658 (65.3)	180 (7.1) x 40 (1.6)	224 (8.8)
	875 (34.4)	70 (2.8) dia	589 (23.2)

CONDITIONS DURING TEST

Overall dimensions

(front: 14.9 - 28, rear: 18.4 - 38 tyres fitted)

Length, m (in)	Width m (in)	Height at top of, exhaust silencer, m (in)	Height at top of, protective structure, m (in)
4.585 (180.5)	2.250+ (88.6)	3.064 (120.6)	2.900 (114.2)

+ Top outer edge of front tyres

Ground clearance

Clearance: 468 mm (18.4 in) To underside of drawbar frame

Track setting

Front: 1824 mm (71.8 in)

Rear: 1626 mm (64.0 in)

Tractor mass

(without driver but with tanks full, with cab)

Front, kg (lb)	Rear, kg (lb)	Total, kg (lb)
1676 (3696)	2810 (6195)	4486 (9891)

Fuel and lubricants used in tests

Fuel

Type: Diesel oil to class D British Standard 2869:1970

Density at 15°C (60°F): 0.8515 g/cm^3

Oils	Recommended	Used during test
Engine oil		
Type:	S.A.E. 20W	As recommended
Viscosity:	45 cSt at 50°C (122°F)	
Classification	MIL L-2104-C	
Transmission hydraulic fluid and spiral drive oils		
Type:	S.A.E. 80 EP	As recommended
Viscosity:	54 cSt at 50°C (122°F)	
Classification	MIL L-2105	
Front differential and final drives		
Type:	S.A.E. HYPO ID90	As recommended
Viscosity:	95 to 260 cSt at 50°C (122°F)	
Classification:	MIL L-2105-B	
Steering oil		
Type:	S.A.E. 5W	As recommended
Viscosity:	26 cSt at 50°C (122°F)	
Classification	Unclassified to MIL	
Recommended grease:	NLG1 No. 2	As recommended
Number of lubrication points:	21	

II TEST RESULTS

A COMPULSORY TESTS

1. MAIN POWER TAKE-OFF PERFORMANCE

Date and location of tests: 9th May 1985, NIAE, Silsoe, Bedford, UK.

Type of dynamometer: Water Brake, Heenan & Froude

Power, kW (hp)	Speed, rev/min		Fuel consumption, Hourly,		Specific,	Specific energy,
	Engine	P.t.o.	l/h (UKgal/h)	kg/h (lb/h)	kg/kWh (lb/hph)	kWh/l (hph/UKgal)
MAXIMUM POWER - 2 HOUR TEST						
74.7 (100.2)	2300	1122	24.90 (5.47)	21.14 (46.62)	0.283 (0.465)	2.99 (18.2)
POWER AT RATED ENGINE SPEED						
74.7 (100.2)	2300	1122	24.90 (5.47)	21.14 (46.62)	0.283 (0.465)	2.99 (18.2)
POWER AT STANDARD POWER TAKE-OFF SPEED						
71.0 (95.2)	2049	1000	22.52 (4.95)	19.09 (42.09)	0.269 (0.442)	3.15 (19.1)
PART LOADS						
(i) The torque corresponding to maximum power at rated engine speed						
74.7 (100.2)	2300	1122	24.9 (5.47)	21.14 (46.62)	0.283 (0.465)	2.99 (18.2)
(ii) 85% of the torque obtained in (i)						
64.6 (86.7)	2338	1141	22.74 (5.00)	19.28 (42.51)	0.298 (0.490)	2.84 (17.3)
(iii) 75% of the torque defined in (ii)						
48.9 (65.6)	2358	1151	18.51 (4.07)	15.70 (34.62)	0.321 (0.528)	2.63 (16.0)
(iv) 50% of the torque defined in (ii)						
32.8 (44.0)	2373	1158	15.03 (3.30)	12.75 (28.11)	0.388 (0.638)	2.18 (13.3)
(v) 25% of the torque defined in (ii)						
16.4 (22.0)	2383	1163	11.68 (2.57)	9.91 (21.84)	0.604 (0.993)	1.4 (8.5)
(vi) Unloaded						
0	2430	1186	8.61 (1.89)	7.30 (16.10)	-	-

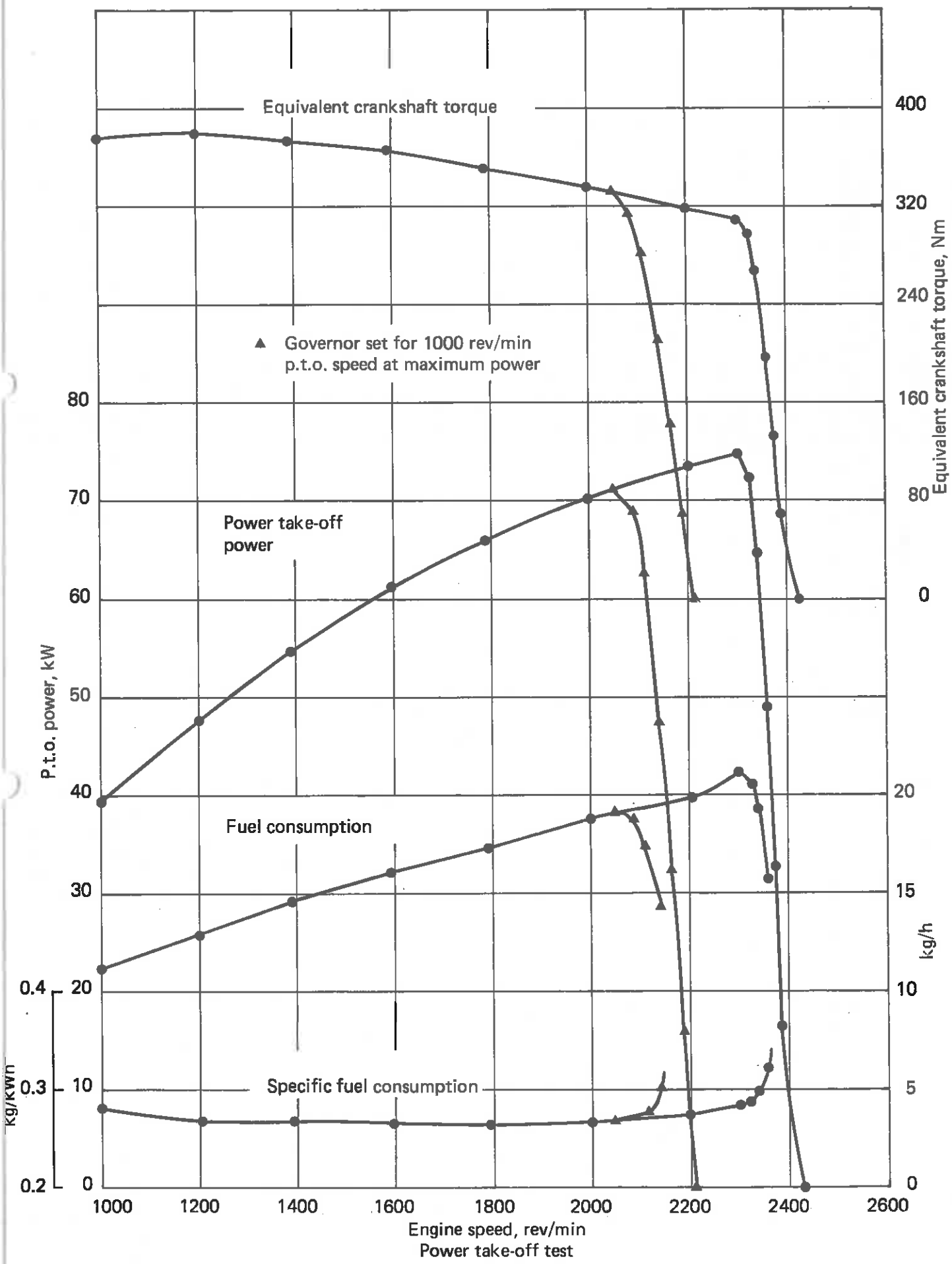
Part loads, the governor hand lever in the position corresponding to the standard p.t.o. speed at full load (1000 rev/min).

Power, kW (hp)	Speed, rev/min		Fuel consumption, Hourly,		Specific,	Specific energy,
	Engine	P.t.o.	l/h (UKgal/h)	kg/h (lb/h)	kg/kWh (lb/hph)	kWh/l (hph/UKgal)
(i) The torque corresponding to maximum power at standard p.t.o. speed						
71.0 (95.2)	2049	1000	22.52 (4.95)	19.09 (42.08)	0.269 (0.442)	3.15 (19.1)
(ii) 85% of the torque obtained in (i)						
62.5 (83.8)	2113	1031	20.37 (4.48)	17.27 (38.08)	0.276 (0.454)	3.06 (18.6)
(iii) 75% of the torque defined in (ii)						
47.5 (63.7)	2140	1044	16.88 (3.71)	14.31 (31.56)	0.301 (0.495)	2.81 (17.1)
(iv) 50% of the torque defined in (ii)						
32.2 (43.2)	2163	1055	13.47 (2.96)	11.42 (25.18)	0.354 (0.582)	2.39 (14.5)
(v) 25% of the torque defined in (ii)						
16.0 (21.4)	2189	1068	10.20 (2.24)	8.65 (19.07)	0.541 (0.890)	1.56 (9.5)
(vi) Unloaded						
0	2212	1079	7.10 (1.56)	6.02 (13.29)	-	-

Standard specific fuel consumption, kg/kWh (lb/hph)

a) 0.298 (0.490)
b) 0.388 (0.638)
c) 0.276 (0.454)
d) 0.354 (0.582)

No load, maximum engine speed		2430 rev/min
Equivalent crankshaft torque at maximum power		310.0 Nm (228.6 lb ft)
Maximum equivalent crankshaft torque		378.7 Nm (279.3 lb ft) at 1200 rev/min engine speed
Mean atmospheric conditions	temperature	18°C (64°F)
	pressure	1008 m bar (29.8 in Hg)
	relative humidity	50%
Maximum temperature	coolant	86°C (187°F)
	engine oil	91°C (196°F)
	fuel	50°C (122°F)
	air intake	23°C (73°F)


Equivalent crankshaft torque
Governor set for 1000 rev/min
p.t.o. speed at maximum power
Power take-off
power
Fuel consumption
Specific fuel consumption
P.t.o. power, kW
Equivalent crankshaft torque, Nm
kg/h
kg/kWh
Engine speed, rev/min
Power take-off test
1000
1200
1400
1600
1800
2000
2200
2400
2600
0
40
50
60
70
80
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240
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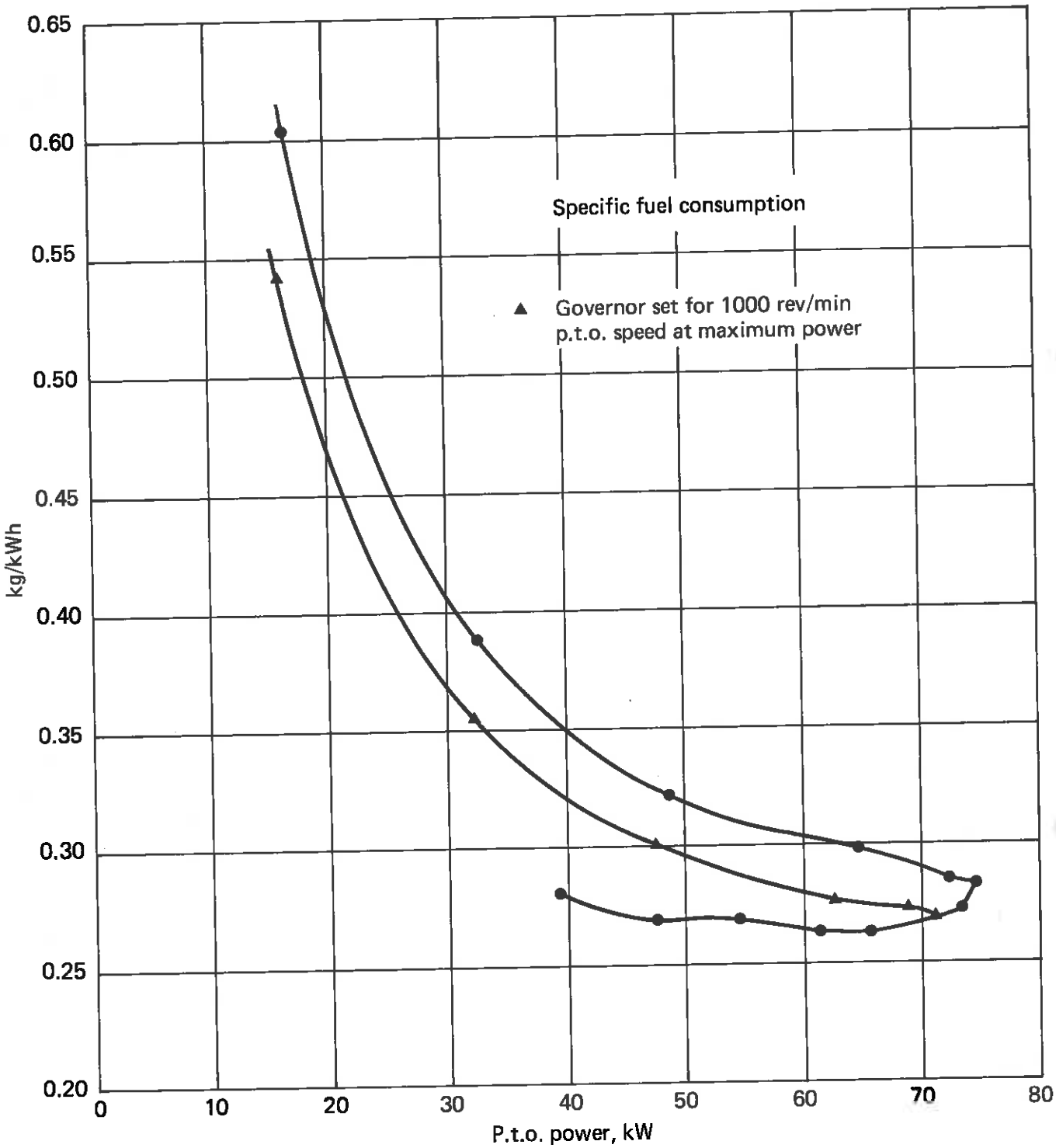

Power take-off test

2 MAXIMUM DRAWBAR POWER, TRANSMISSION AND FUEL CONSUMPTION CHARACTERISTICS

Date of tests: 23rd May 1985
Type of track: Concrete

Height of drawbar above ground: 460 mm (18.1 in)

Tyre size and pressure:
Front: 14.9 -28 83k Pa (12 lb/in^2)
Rear: 18.4 -38 83k Pa (12 lb/in^2)

Gear	Speed, km/h (mile/h)	Power, kW (hp)	Drawbar pull, kN (lb)	Engine speed, rev/min	Wheel-slip, %	Specific fuel consumption, kg/kWh (lb/hph)	kWh/l (hph/UKgal)	Temperature, C (F) Fuel	Coolant	Engine oil	Atmospheric conditions Temperature, C (F)	Relative humidity %	Pressure, m bar (in Hg)
(1) MAXIMUM DRAWBAR POWER IN GEARS													
2L	4.10 (2.57)	+44.5 (59.7)	39.0 (8768)	2350	12.3	0.393 (0.646)	2.15 (13.1)	40 (104)	84 (183)	82 (180)	13 (55)	58.8	1005 (29.68)
3LM	4.34 (2.72)	+46.8 (62.8)	38.9 (8745)	2348	10.6	0.376 (0.619)	2.25 (13.7)	42 (108)	83 (181)	84 (183)	12 (54)	64.8	1005 (29.68)
3L	5.30 (3.31)	+56.1 (75.2)	38.3 (8610)	2315	10.3	0.382 (0.628)	2.21 (13.5)	39 (102)	82 (180)	83 (181)	11 (52)	66.9	1005 (29.68)
4LM	5.87 (3.67)	62.1 (83.3)	38.1 (8565)	2306	10.1	0.355 (0.584)	2.38 (14.5)	40 (104)	85 (185)	82 (180)	11 (52)	65.3	1005 (29.68)
4L	7.95 (4.97)	64.4 (86.4)	29.2 (6564)	2304	4.4	0.341 (0.561)	2.48 (15.1)	41 (106)	84 (183)	84 (183)	11 (52)	67.5	1005 (29.68)
1HM	8.88 (5.55)	65.5 (87.8)	26.6 (5980)	2307	3.8	0.338 (0.556)	2.50 (15.2)	38 (100)	85 (185)	85 (185)	11 (52)	67.8	1005 (29.68)
1H	11.58 (7.24)	64.7 (86.8)	20.1 (4519)	2304	2.8	0.346 (0.569)	2.44 (14.9)	39 (102)	84 (183)	84 (183)	11 (52)	67.7	1005 (29.68)
2HM	12.29 (7.68)	67.3 (90.2)	19.7 (4429)	2308	2.7	0.334 (0.549)	2.53 (15.4)	39 (102)	84 (183)	85 (185)	11 (52)	68.4	1005 (29.68)
2H	15.96 (9.98)	64.5 (86.5)	14.6 (3282)	2310	2.0	0.349 (0.574)	2.43 (14.8)	40 (104)	85 (185)	86 (187)	11 (52)	66.4	1005 (29.68)
(2a) TRANSMISSION AND FUEL CONSUMPTION CHARACTERISTICS													
i) SELECTED GEAR (Speed closest to 7.5 km/h)													
4L	7.95 (4.97)	64.4 (86.4)	29.2 (6564)	2304	4.4	0.341 (0.561)	2.48 (15.1)	41 (106)	84 (183)	84 (183)	11 (52)	67.5	1005 (29.68)
ii) 75% OF PULL AT MAXIMUM POWER													
4L	8.24 (5.15)	50.1 (67.2)	21.9 (4923)	2344	3.0	0.366 (0.602)	2.31 (14.1)	39 (102)	82 (180)	83 (181)	13 (55)	60.4	1005 (29.68)
iii) 50% OF PULL AT MAXIMUM POWER													
4L	8.43 (5.27)	34.2 (45.9)	14.6 (3282)	2362	2.0	0.420 (0.691)	2.02 (12.3)	41 (106)	82 (180)	82 (180)	12 (54)	59.9	1005 (29.68)
HIGHEST GEAR ... SAME PULL AS IN ii), REDUCED ENGINE SPEED													
2HM	8.27 (5.11)	50.3 (67.5)	21.9 (4923)	1557	3.0	0.307 (0.505)	2.75 (16.8)	38 (100)	81 (178)	72 (162)	9 (48)	73.3	1001 (29.56)
HIGHEST GEAR ... SAME PULL AS IN iii), REDUCED ENGINE SPEED													
2HM	8.42 (5.26)	34.1 (45.7)	14.6 (3282)	1564	2.0	0.315 (0.518)	2.69 (16.4)	37 (99)	80 (176)	71 (160)	9 (48)	71.8	1001 (29.56)
(2b) TRANSMISSION AND FUEL CONSUMPTION CHARACTERISTICS													
i) SELECTED GEAR (maximum power)													
2HM	12.29 (7.68)	67.3 (90.2)	19.7 (4429)	2308	2.7	0.334 (0.549)	2.53 (15.4)	39 (102)	84 (183)	85 (185)	11 (52)	68.4	1005 (29.68)
ii) 75% OF PULL AT MAXIMUM POWER													
2HM	12.61 (7.88)	52.1 (69.9)	14.9 (3350)	2345	2.1	0.364 (0.599)	2.32 (14.1)	42 (108)	83 (181)	80 (176)	12 (54)	59.4	1005 (29.68)
iii) 50% OF PULL AT MAXIMUM POWER													
2HM	12.83 (8.02)	34.9 (46.8)	9.8 (2203)	2362	1.5	0.421 (0.693)	2.01 (12.3)	41 (106)	83 (181)	81 (178)	12 (54)	61.3	1005 (29.68
HIGHEST GEAR SAME PULL AS IN ii), REDUCED ENGINE SPEED													
3HM	12.73 (7.96)	52.1 (69.9)	14.7 (3305)	1762	2.0	0.313 (0.515)	2.70 (16.5)	37 (99)	83 (181)	75 (167)	9 (48)	73.8	1001 (29.56)
HIGHEST GEAR SAME PULL AS IN iii), REDUCED ENGINE SPEED													
3HM	12.89 (8.06)	35.9 (48.1)	10.0 (2248)	1768	1.6	0.337 (0.554)	2.51 (15.3)	35 (95)	82 (180)	74 (165)	9 (48)	74.2	1001 (28.58)

+ Maximum power limited by wheelslip and bounce

3. LIFTING FORCE AND HYDRAULIC POWER

Date and location of tests: 17th and 20th June 1985

Hydraulic fluid

Make and type: Ford, S.A.E. 80 E.P.
Viscosity: 54 cSt at 50°C (122°F)

Type of hydraulic system: Closed centre, load sensing, supplied by fixed displacement pumps, via unloading valves

Hydraulic fluid temperature at beginning of test: 60°C

Power lift test (with single assist ram)

	Height of lower hitch point above ground in down position, mm (in)	Vertical movement, mm (in)	Maximum force exerted through full range, kN (lb)	Corresponding pressure of hydraulic fluid, MPa (lb/in^2)	Moment about rear axle, kNm (lbft)	Maximum tilt angle of mast over range of lift, degrees
At the hitch point	200 (7.9)	580 (22.8)	27.1 (6090)	15.0 (2180)	27.8 (20504)	-
On the frame	200 (7.9)	795 (31.3)	20.7 (4650)	15.0 (2180)	33.9 (25003)	14°

Main linkage dimensions - see drawings and table on pages 8 and 9

Lifting heights relative to the horizontal plane including the lower link pivot points

mm	-460	-400	-340	-200	-100	0	100	240	335
in	18.1	15.7	13.4	7.9	3.9	0	3.9	9.4	13.2

Lifting forces at hitch points
(corresponding pressure 15.0 MPa 2180 lb/in^2)

kN	-	-	27.1	29.1	30.2	30.4	30.4	30.4	-
lb	-	-	6090	6540	6790	6830	6830	6830	-

Lifting forces at test frame
(corresponding pressure 15.0 MPa 2180 lb/in^2)

kN	24.7	24.4	24.5	24.4	24.0	23.6	23.2	22.2	20.7
lb	5550	5490	5510	5490	5400	5310	5220	4990	4650

Hydraulic power test

Sustained pressure with relief valve open	18.0 MPa	(2610 lb/in^2)
Pump delivery rate at minimum pressure	40.0 l/min	(8.8 gal/min)

Flow rate corresponding to a hydraulic pressure equivalent to 90 per cent of the actual relief valve pressure setting and corresponding hydraulic power

Flow rate	29.2 l/min	(6.4 gal/min)
Pressure	16.2 MPa	(2350 lb/in^2)
Power	7.8 kW	(10.5 h.p.)

Flow rate and hydraulic pressure corresponding to maximum hydraulic power

Flow rate	34.5 l/min	(7.6 gal/min)
Pressure	15.0 MPa	(2180 lb/in^2)
Power	8.7 kW	(11.7 h.p.)

Tapping point used for test: Auxiliary service connection

Temperature of hydraulic fluid, if different from 65° ± 5°C	Not applicable
Opening pressure of the unloading valve	Not applicable
Closing pressure of the unloading valve	Not applicable

B. SUPPLEMENTARY LIFTING FORCE TESTS

1. Linkage set as for compulsory tests with one additional assist ram fitted

Date and location of tests: 17th and 20th June 1985

Hydraulic fluid

Make and type: Ford, S.A.E. 80 E.P.
Viscosity: 54 cSt at 50°C (122°F)

Type of hydraulic system: Closed centre, load sensing, supplied by fixed displacement pumps, via unloading valves

Hydraulic fluid temperature at beginning of test: 50°C

Power lift test (with two assist rams)

	Height of lower hitch point above ground in down position, mm (in)	Vertical movement, mm (in)	Maximum force exerted through full range, kN (lb)	Corresponding pressure of hydraulic fluid, MPa (lb/in^2)	Moment about rear axle, kNm (lbft)	Maximum tilt angle of mast over range of lift, degrees
At the hitch point	200 (7.9)	580 (22.8)	36.7 (8250)	15.0 (2180)	37.7 (27806)	-
On the frame	200 (7.9)	795 (31.3)	27.5 (6180)	15.0 (2180)	45.0 (33190)	14

Main linkage dimensions - see drawings and table on pages 8 and 9

Lifting heights relative to the horizontal plane including the lower link pivot points

mm	-460	-400	-340	-200	-100	0	100	240	335
in	18.1	15.7	13.4	7.9	3.9	0	3.9	9.4	13.2

Lifting forces at hitch points
(corresponding pressure 15.0 MPa 2180 lb/in^2)

kN	-	-	36.7	39.0	40.0	40.1	40.1	40.2	-
lb	-	-	8250	8770	9000	9010	9010	9040	-

Lifting forces at test frame
(corresponding pressure 15.0 MPa 2180 lb/in^2)

kN	37.0	36.6	36.3	36.4	35.5	33.5	31.5	28.5	27.5
lb	8320	8230	8160	8180	7980	7530	7080	6410	6180

2. Linkage set in accordance with the manufacturers recommendations for general use, one assist ram fitted only

Date and location of tests: 17th and 20th June 1985

Hydraulic fluid

Make and type: Ford, S.A.E. 80 E.P.
Viscosity: 54 cSt at 50°C (122°F)

Type of hydraulic system: Closed centre, load sensing, supplied by fixed displacement pumps, via unloading valves

Hydraulic fluid temperature at beginning of test: 50°C

Power lift test (with single assist ram)

	Height of lower hitch point above ground in down position, mm (in)	Vertical movement, mm (in)	Maximum force exerted through full range, kN (lb)	Corresponding pressure of hydraulic fluid, MPa (lb/in^2)	Moment about rear axle, kNm (lbft)	Maximum tilt angle of mast over range of lift, degrees
At the hitch point	451 (17.8)	570 (22.4)	33.9 (7620)	15.0 (2180)	34.8 (25678)	–
On the frame	401 (15.8)	735 (28.9)	22.2 (4990)	15.0 (2180)	36.3 (26785)	13°

Main linkage dimensions - see drawings and table on pages 8 and 25

Lifting heights relative to the horizontal plane including the lower link pivot points

mm	-180	-120	0	100	200	300	400	520
in	7.1	4.7	0	3.9	7.9	11.8	15.7	20.5

Lifting forces at hitch points
(corresponding pressure 15.0 MPa 2180 lb/in^2)

kN	–	33.9	35.0	35.5	35.5	35.2	34.5	-
lb		7620	7870	7980	7980	7910	7760	-

Lifting forces at test frame
(corresponding pressure 15.0 MPa 2180 lb/in^2)

kN	31.3	30.8	30.0	29.1	27.9	26.2	24.5	22.2
lb	7040	6920	6740	6540	6270	5890	5510	4990

3. Linkage set as for test 2 but with one additional assist ram fitted

Date and location of tests: 17th and 20th June 1985

Hydraulic fluid

Make and type: Ford, S.A.E. 80 E.P.
Viscosity: 54 cSt at 50°C (122°F)

Type of hydraulic system: Closed centre, load sensing, supplied by fixed displacement pumps, via unloading valves

Hydraulic fluid temperature at beginning of test: 50°C

Power lift test (with two assist rams)

	Height of lower hitch point above ground in down position, mm (in)	Vertical movement, mm (in)	Maximum force exerted through full range, kN (lb)	Corresponding pressure of hydraulic fluid, MPa (lb/in^2)	Moment about rear axle, kNm (lbft)	Maximum tilt angle of mast over range of lift, degrees
At the hitch point	451 (17.8)	570 (22.4)	44.7 (10050)	15.0 (2180)	45.9 (33854)	-
On the frame	401 (15.8)	735 (28.9)	29.5 (6630)	15.0 (2180)	48.3 (35624)	13°

Main linkage dimensions - see drawings and table on pages 8 and 25

Lifting heights relative to the horizontal plane including the lower link pivot points

mm	-180	-120	0	100	200	300	400	520
in	7.1	4.7	0	3.9	7.9	11.8	15.7	20.5

Lifting forces at hitch points
(corresponding pressure 15.0 MPa 2180 lb/in^2)

kN	-	44.7	46.1	46.6	46.5	46.0	45.4	-
lb	-	10050	10360	10480	10450	10340	10210	-

Lifting forces at test frame
(corresponding pressure 15.0 MPa 2180 lb/in^2)

kN	40.8	40.0	39.4	38.0	35.4	34.2	31.8	29.5
lb	9170	8990	8860	8540	7960	7690	7150	6630

Linkage dimensions for the lifting test in accordance with the manufacturers recommendations for general use

Rear tyres (size 18.4-38) radius index:		(r)	820 mm	(32.3 in)
Front tyres (size 14.9-28) radius index:		(r')	640 mm	(25.2 in)
Length of lift arms:		(A)	229 mm	(9.0 in)
Length of lower links:		(B)	925 mm	(36.4 in)
Distance of lift arm pivot point from rear wheel centre line	horizontally:	(a)	102 mm	(4.0 in)
	vertically:	(b)	340 mm	(13.4 in)
Horizontal distance between the 2 lower link points:		(u)	514 mm	(20.2 in)
Horizontal distance between the 2 lift arm end points:		(v)	582 mm	(22.9 in)
Length of top link:		(S)	694 mm	(27.3 in)
Distance of top link pivot point from rear wheel centre line	horizontally:	(c)	337 mm	(13.3 in)
	vertically:	(d)	146 mm	(5.7 in)
Distance of lower link pivot point from rear wheel centre	horizontally:	(e)	102 mm	(4.0 in)
	vertically:	(f)	229 mm	(9.0 in)
Distance of lower link pivot points to lift rod pivot points on lower links:		(D)	520 mm	(20.5 in)
Length of lift rods:		(L)	787 mm	(31.0 in)
Height of lower hitch points relative to the rear wheel centre line, situated 820 mm above the ground level				
- in low position:		(h)	140 mm	(5.5 in)
- in high position:		(H)	429 mm	(16.9 in)
Height of lower hitch points when locked in transport position:		Any height within lift range		

REPAIRS AND ADJUSTMENTS DURING TESTS: None

REMARKS: None

Test carried out at NIAE by: J.P. Evans; P.A. Pope

Officer in charge: P.C. Seward

Signed: D.W. Smith Head of Tractor Test Section

R.M. Stayner for the Director

Date: 26th July 1985.