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## Test 711: Caterpillar Model D-8 (Diesel)

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, [tractortestlab@unl.edu](mailto:tractortestlab@unl.edu)

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# NEBRASKA TRACTOR TEST NO. 711 - CATERPILLAR D-8 DIESEL

The University of Nebraska Agricultural Experiment Station

W. V. Lambert, Director, Lincoln, Nebraska

## DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank shaft speed rpm	% Slip of drive wheels	Fuel Consumption		Hp-hr per gal	Temp. Degrees F			Barometer inches of mercury
					Gal per hr	Lb per hp-hr		Cooling med	Air wet bulb	Air dry bulb	
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—2nd Gear											
168.38	33452	1.89	1197	2.70	13.150	0.547	12.80	164	71	92	28.878
75% of Pull at Maximum Power—Ten Hours—2nd Gear											
140.23	26535	1.98	1243	1.92	11.317	0.566	12.39	159	71	90	28.838
50% of Pull at Maximum Power—Two Hours—2nd Gear											
103.28	18850	2.05	1275	0.79	8.984	0.610	11.50	156	74	94	28.850
MAXIMUM POWER WITH BALLAST											
173.69	45526	1.43	1196	4.23	1st Gear.....		155	68	81		28.870
177.44	35211	1.89	1199	2.98	2nd Gear.....		149	67	78		28.890
174.57	24630	2.66	1198	1.35	3rd Gear.....		167	73	92		28.840
167.45	18023	3.48	1196	0.85	4th Gear.....		159	73	92		28.830
157.26	12913	4.57	1201	0.63	5th Gear.....		161	71	90		28.855
140.21	8310	6.33	1202	0.52	6th Gear.....		168	71	90		28.855
VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—2nd Gear											
Pounds pull		35200		37650		38450		40750		36300	
Horsepower		177.4		170.7		153.8		141.3		106.5	
Miles per hour		1.9		1.7		1.5		1.3		1.1	

## Department of Agricultural Engineering

Dates of Test: August 3 to August 12, 1959

Manufacturer: CATERPILLAR TRACTOR COMPANY, PEORIA, ILLINOIS

Manufacturer's Power Rating: 180 drawbar horsepower (corrected to standard conditions)

**FUEL, OIL and TIME** Fuel No 2 Diesel Cetane No 51 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.8418 Weight per gallon 7.009 lb Oil SAE 30 API service classification DS To motor 8.296 gal Drained from motor 7.576 gal Transmission and final-drive lubricant SAE No 90 Type straight mineral oil Total time motor was operated 34½ hours.

**ENGINE** Make Caterpillar Diesel Type 6 cylinder vertical with turbocharger Serial No 36A1207 Crankshaft mounted lengthwise Rated rpm 1200 Lubrication pressure Bore and stroke 5¼" x 8" Compression ratio 15.7 to 1 Displacement 1246 cu in Air cleaner dry type replaceable paper element Muffler not used Oil filter two replaceable paper elements Fuel filter one primary screen filter and one secondary replaceable paper element Cooling medium temperature control thermostat.

**STARTING ENGINE** Make Caterpillar Type 2 cylinder vertical Mounted left side of diesel engine Mfg rating 25 H.P. at 2700 rpm Bore and stroke 3⅝" x 4" Ignition system magneto Air cleaner oil washed wire mesh Starting system 12 volt electric.

**CHASSIS** Type tracklayer Serial No 36A1207 Tread width 84" Wheel base 115" Drawbar height 20" Measured length of track 29.3 ft Cleats integral with shoes Cleats per track 39 Size of cleats 24" x 2⅜" Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 56.4" Vertical distance above roadway 36.5" Horizontal distance from center of rear wheel tread 0.2" to the left Cable control system direct engine drive Advertised speeds mph first 1.5 second 1.9 third 2.7 fourth 3.5 fifth 4.6 sixth 6.3 reverse first 1.5 second 2.0 third 2.7 fourth 3.6 fifth 4.6 sixth 6.4 Clutch oil type three plates over center with hydraulic booster Brakes oil cooled contracting bands operated by two independent hydraulically aided foot pedals Steering hand levers controlling multiple disc clutches with hydraulic booster Turning space diameter (with brake applied) right 285" left 285".

Total weight with operator 53,655 pounds including crankcase guards 734 lbs, track roller guards 650 lbs, front pull hook 82 lbs, push plate 2750 lbs, lighting system 37 lbs, and cable control system 2180 lbs.

**REPAIRS AND ADJUSTMENTS** No repairs or adjustments.

**REMARKS** All test results were determined from observed data obtained in accordance with SAE and ASAE test code. No belt power take-off performance runs were made on this tractor due to limited capacity of the dynamometer.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No 711.

L. F. LARSEN  
Engineer-in-Charge

L. W. HURLBUT  
G. W. STEINBRUEGGE  
J. J. SULEK  
Board of Tractor  
Test Engineers

# EXPLANATION OF TEST REPORT

## GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

## PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

## BELT OR POWER TAKE-OFF PERFORMANCE

**Maximum Power and Fuel Consumption.** The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

**Varying Power and Fuel Consumption.** Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque,  $\frac{1}{2}$  the 85% torque; maximum power;  $\frac{1}{4}$  and  $\frac{3}{4}$  of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

## DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

**Varying Power and Fuel Consumption With Ballast.** The varying power runs are made to show the effect of speed-control devices (engine governor, automatic transmissions, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree

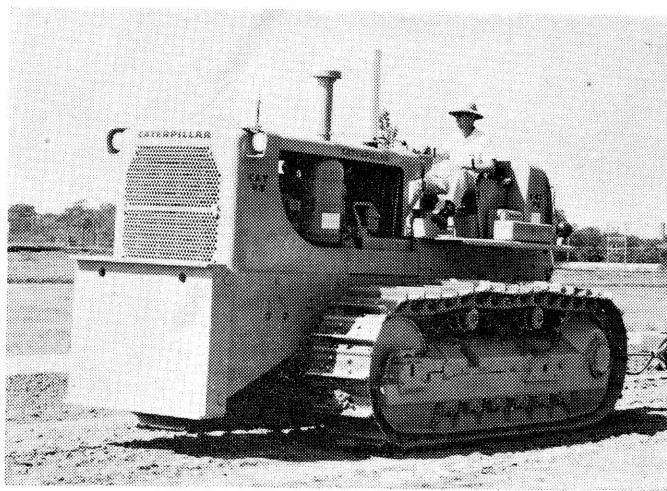
turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

**Maximum Power with Ballast.** Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

**Maximum Power Without Ballast.** All added ballast is removed from the tractor. The maximum drawbar power of the tractor is determined by the same procedure used for getting maximum power with ballast. The gear (or travel speed) is the same as that used in the 10-hour test.

**Varying Power and Travel Speed with Ballast.** Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions; (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the Nebraska Tractor Tests write to the Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.



Caterpillar D-8 Diesel