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## Test 519: Harris Four-Wheel-Drive FDW-C

Nebraska Tractor Test Lab

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Department of Agricultural Engineering  
Dates of test: May 18 to May 22, 1954  
Manufacturer: HARRIS MANUFACTURING COMPANY, STOCKTON, CALIFORNIA  
Manufacturer's rating: Approximately 49 hp.

NEBRASKA TRACTOR TEST NO. 519

HARRIS FOUR-WHEEL-DRIVE FDW-C

# DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lb	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption			Water used gal per hour	Temp Deg F		Barometer inches of mercury
					Gal per hour	Hp-hr per gal	Lb per hp-hr		Cooling med	Air	
TESTS F & G—100% MAXIMUM LOAD											
31.37	6528	1.80	1789	17.66	.....	Not Recorded	.....	.....	160	72	28.910
*42.62	5068	3.15	1799	8.55	.....	Not Recorded	.....	.....	160	72	28.920
43.63	3542	4.62	1803	5.16	.....	Not Recorded	.....	.....	160	72	28.915
34.74	948	13.74	1804	2.47	.....	Not Recorded	.....	.....	160	70	28.910
TEST H—RATED LOAD—TEN HOURS—3rd Gear											
34.33	2788	4.62	1799	5.07	3.345	10.26	0.680	0.00	158	70	28.773
TEST J—OPERATING MAXIMUM LOAD—3rd Gear											
39.09	3258	4.50	1800	7.00	.....	Not Recorded	.....	.....	160	75	28.700
TEST K—OPERATING MAXIMUM LOAD—3rd Gear											
38.54	3678	3.93	1795	11.11	.....	Not Recorded	.....	.....	162	75	28.700

# TIRES, WHEELS AND WEIGHT

	Tests F, G & H	Test J	Test K
Rear wheels			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	270 lb each	None	None
Added cast iron	575 lb each	None	None
Rear tires			
No. and size	Two 13-24	Two 13-24	Two 11-24
Ply	6	6	4
Air pressure	16 lb	12 lb	12 lb
Front wheels			
Type	Pressed steel	Pressed steel	Pressed steel
Liquid ballast	371 lb each	None	None
Added cast iron	920 lb each	None	None
Front tires			
No. and size	Two 13-24	Two 13-24	Two 11-24
Ply	6	6	4
Air pressure	16 lb	12 lb	12 lb
Height of drawbar	13½ inches	13 inches	11 inches
Static weight			
Rear end	4680 lb	2990 lb	2860 lb
Front end	5590 lb	3008 lb	2880 lb
Total weight as tested with operator	10,445 lb	6173 lb	5915 lb



**FUEL, OIL and TIME** Diesel fuel Cetane No. 50 (rating taken from oil company's typical inspection data) weight per gallon 6.979 lb OIL SAE 30; to motor 2.670 gal; drained from motor 2.373 gal Total time motor was operated 28 hours.

**CHASSIS TYPE** 4 wheel drive Serial No. PH-431194 Tread width rear 48" to 76" front 48" to 76" Wheel Base 54" Hydraulic control system not available Advertised speeds mph first 2.16 second 3.41 third 4.79 fourth 13.86 reverse 1.77 Belt pulley not available Clutch dry disc operated by foot pedal Seat upholstered Brakes external contracting band operated by foot pedal on each side Equalized no Power take-off not available.

**ENGINE** Make General Motors Type 2-cylinder vertical—2 cycle Diesel Serial No. 2A-19724 Crankshaft mounted lengthwise Head I Lubrication pressure Bore and Stroke 4¼" x 5" Rated rpm 1800 Compression ratio 16 to 1 Displacement 142 cu. in. Port Diameter Valves Inlet multiple ports Exhaust 1.250 Governor variable speed centrifugal Starting System 12-volt Air cleaner oil washed wire mesh Muffler was used Oil filter partial flow replaceable element Fuel filter full flow absorption type elements in both primary and secondary filters Cooling medium temperature control thermostat.

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

**REMARKS** All test results were determined from observed data and without allowances, additions or deductions. Test F was made with fuel pumps as set by the manufacturer and data from this test were used in determining the horsepower to be developed in test H. Tests G, H, J & K were made with the same setting.

# HORSEPOWER SUMMARY

- |   |         |
|---|---------|
|   | Drawbar |
| 1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" HG)   | 45.67   |
| 2. Observed maximum horsepower (tests F and B)  | 43.63   |
| 3. Seventy-five per cent of calculated maximum drawbar horsepower and eight-five per cent of calculated maximum belt horsepower (formerly ASAE and SAE ratings) | 34.25   |

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 519.

L. F. LARSEN  
Engineer-in-Charge

C. W. SMITH  
L. W. HURLBUT  
F. D. YUNG  
Board of Tractor  
Test Engineers

## EXPLANATION OF TEST REPORT

**TEST A:** The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissible include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

### BELT HORSEPOWER TESTS

**TEST B:** The throttle valve is held wide open, and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

**TEST C:** For tractors with carburetors the best fuel economy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is held wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors which have an altogether different fuel system.

**TEST D:** The throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

### TEST E:

**Varying load** serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads of 20 minutes each: rated load, no load,  $\frac{1}{2}$  rated load, maximum load at wide open throttle valve,  $\frac{1}{4}$  and  $\frac{3}{4}$  rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

**Torque, lb-ft at dynamometer,** is obtained with wide open throttle and sufficient load is applied to give several readings.

### DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instrument in the test car. All tests are made on the same dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

**TEST F:** A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in this test. The drawbar load is adjusted to give rated engine speed.

**TEST G:** Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 16%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

**TEST H:** Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated load the throttle control lever is set to maintain rated engine speed. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

**TEST J:** The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

**TEST K:** Similar to test J except that the smallest tires and lightest wheels offered by the manufacturer are used.