

TEST PROCEDURE FOR DETERMINING
MOISTURE-CORROSION CHARACTERISTICS
OF UNIVERSAL GEAR LUBRICANTS

(CRC Designation L-21-445)

SCOPE

1. This procedure is intended for use in determining the moisture-corrosion characteristics of universal gear lubricants.

APPARATUS

2. The apparatus (CRC Designation EL-21-445) shall consist of the following:

(a) Axle Test Unit: Built up from parts for a passenger-car rear axle. For list of parts required and directions for assembly, see section A1. (With the exception of the housing, which may be reconditioned, all parts must be new.)

(b) Test Stand and Driving Mechanism: For description of apparatus required, see section A2.

(c) Temperature-Control Apparatus: For dimensions and description of heat-insulating enclosure for test unit, see section A3.

(d) Heating Apparatus: A 500-watt electric heater of the radiant type.

(e) Storage Rack: Constructed to permit storing the test unit in position similar to that which it would occupy if installed in a car.

PREPARATION OF TEST UNIT

3. Equipment used in the conduct of this test shall be prepared in the manner described below:

(a) Prior to a test, the rear-axle housing and the differential-carrier assembly shall be cleaned thoroughly in the manner described below:

(1) Wash all gear lubricant from rear-axle housing and differential-carrier assembly, using a suitable solvent.

(2) Immerse the parts in a 1 percent solution of sodium hydroxide in water at a temperature of from 175° to 195°F (79.4° to 90.6°C) for 1 hour.

(3) Rinse the parts with water until free of caustic.

(4) Dry the parts by rinsing with methanol, followed by air-blowing to remove the methanol.

(b) Assembly of all parts of the test unit shall then be completed, and the unit placed on the test stand and connected with the driving mechanism.

(c) The heat-insulating enclosure shall be installed on the test unit.

TEST PROCEDURE

4. The test procedure to be employed is as follows:

(a) Distilled water in the amount of 28 ml is put into the axle housing, which is then filled to the level plug with the gear lubricant to be tested. This requires 3 pints.

(b) The propeller shaft is rotated for a period of 4 hours at a speed of 2400 ± 25 rpm, during which time the lubricant is maintained at a temperature of $180^{\circ} \pm 2^{\circ}\text{F}$ ($82.2^{\circ} \pm 1.1^{\circ}\text{C}$) by application of heat from the radiant-heater unit. The 4-hour test interval is measured from the time the specified temperature is reached, and control of temperature is maintained by adjusting the position of the heater unit.

(c) At the end of the 4-hour period, the drive is stopped, the heat-insulating enclosure is removed, and the axle test unit is placed on the storage rack without draining the lubricant. There it is allowed to remain for a 10-day period at room temperature.

(d) At the end of the 10-day storage period, the lubricant is drained, and the axle disassembled for inspection.

REPORTING RESULTS

5. The rating of the lubricant shall be based upon visual inspection for rusting of the gears, the pinion-gear bearing, the differential-carrier bearings, and the differential-gear thrust surfaces.

Appendix I

Apparatus

AXLE TEST UNIT

A1. (a) The parts required for one axle test unit with the manufacturer's parts no. are listed in Table LX. (These parts may be secured from the Chevrolet Motor Division, General Motors Corp., Detroit, Michigan.)

(b) The tubular ends of the rear-axle housing shall be cut off at a point 12-1/2 in. each side of the center of the opening for the differential-carrier assembly. The ends of the tube shall be sealed.

(c) The axle test unit shall be assembled in accordance with instructions in the Chevrolet Shop Manual, 1942 edition, section 4, p 1-9. (Copies of the 1942 Chevrolet Shop Manual may be obtained from the Chevrolet Motor Division, General Motors Corp., Detroit, Michigan.)

TABLE LX
REQUIRED PARTS AND NUMBERS

Parts	No. Required	Manufacturer's Part No.
Rear-axle-housing assembly.....	1	605336
Propeller-shaft housing and differential-carrier assembly.....	1	605335
Axle-housing-cover with filler plug.....	1	475308
Axle-housing-cover gasket.....	1	593017
Axle-housing to differential-carrier gasket...	1	593012
Rear-axle ventilator.....	1	3664539
Pinion-shaft-bearing lock screw.....	3	358073
Check nut for lock screw.....	3	124934
Propeller-shaft-housing bushing, front.....	1	3652601
Propeller-shaft-housing bushing, rear.....	1	3652328
Shaft packing washer seal.....	1	3652523
Differential case.....	1	593009
Differential side bearing.....	2	127861
Differential-bearing adjusting nut.....	2	472542
Adjusting-nut lock.....	2	472539
Ring gear and pinion.....	1	604397
Ring-gear screw.....	10	596529
Ring-gear-screw lock washer.....	10	$\frac{3}{8}$ in.
Pinion-shaft rear bearing.....	1	125630
Pinion-shaft rear-bearing lock ring.....	1	377722
Shaft-bearing lock sleeve.....	1	3656896
Pinion-shaft front bearing.....	1	905306
Pinion-shaft-bearing shim (one 0.015 in., one 0.018 in.).....	2	3657740
Pinion-shaft-bearing lock nut.....	1	595904
Propeller shaft.....	1	3657335
Propeller-shaft coupling pin.....	1	3657332

TEST STAND AND DRIVING MECHANISM

A2. (a) A part of the test consists of supporting the test unit in approximately the position it would occupy in a passenger car, and rotating the propeller shaft at a given speed.

(b) The test stand shall consist of a suitable frame on which the test unit may be secured in a level position by clamping the tubular portion of each side of the unit.

(c) The driving mechanism shall consist of an electric motor, 1 hp or larger, fitted with a pulley for double V-belt to a counter shaft which is to be run at 2400 $\pm$ 25 rpm. The countershaft may be mounted above the motor, and shall be fitted at its driving end with a sleeve having a splined hole

to receive the splined end of the propeller shaft of the test unit. A tubular rubber driving connection may be provided between the countershaft and the splined sleeve to allow for slight misalignment between countershaft and propeller shaft.

(d) When assembled, the countershaft and propeller shaft shall be at approximately the same angle to the horizontal as the propeller shaft would be when installed in a car.

HEAT-CONTROL APPARATUS

A3. (a) To bring the test unit up to the specified temperature and hold it steadily at that point, a heat-insulating enclosure is required.

(b) The enclosure shall be made of masonite or suitable equivalent, lined with hair felt. It shall consist of a rear box-like part having interior measurements of 19 in. long (in line with the axle housing) by 11 in. wide (in line with the propeller shaft) by 15 in. deep vertically, joined to a front part having tapered sides which extend 14 in. from the rear part (19 in. x 15 in.) and terminate in a front side 5 in. wide by 8 in. deep vertically.

The enclosure shall be divided on its horizontal center line, and provided with openings on four sides as follows:

- (1) 2-1/2-in. diameter at midpoint of the front side, for the propeller shaft
- (2) 8-in. diameter at midpoint of the rear side, for the heating apparatus
- (3) 3-in. diameter at midpoint of each 11 in. x 15 in. end of the rectangular section, for the tubular axle housing.

(c) It is necessary to arrange the heat-insulating enclosure so that the radiant heater may be placed in line with the 8-in. opening in the enclosure.