



Designation: **D7450 – 13 D7450 – 19**

Standard Specification for Performance of Rear Axle Gear Lubricants Intended for API Category GL-5 Service¹

This standard is issued under the fixed designation D7450; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This specification covers test methods and acceptance criteria for determining the acceptability of gear oils for applications that specify a lubricant meeting the performance requirements of API Category GL-5 service. Lubricants that meet these performance requirements are typically intended for use in automotive axles, particularly those containing hypoid gears, operating under various combinations of high-speed/shock-load and low-speed/high-torque conditions.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

[D130 Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test](#)

[D892 Test Method for Foaming Characteristics of Lubricating Oils](#)

[D5704 Test Method for Evaluation of the Thermal and Oxidative Stability of Lubricating Oils Used for Manual Transmissions and Final Drive Axles](#)

[D6121 Test Method for Evaluation of Load-Carrying Capacity of Lubricants Under Conditions of Low Speed and High Torque Used for Final Hypoid Drive Axles](#)

[D7038 Test Method for Evaluation of Moisture Corrosion Resistance of Automotive Gear Lubricants](#)

[D7452 Test Method for Evaluation of the Load Carrying Properties of Lubricants Used for Final Drive Axles, Under Conditions of High Speed and Shock Loading](#)

[D8165 Test Method for Evaluation of Load-Carrying Capacity of Lubricants Used in Hypoid Final-Drive Axles Operated under Low-Speed and High-Torque Conditions](#)

2.2 Military Standards:³

[MIL-L-2105C Lubricating Oil, Gear, Multipurpose](#)

[MIL-L-2105D Lubricating Oil, Gear, Multipurpose](#)

[MIL-PRF-2105E Lubricating Oil, Gear, Multipurpose](#)

2.3 SAE Documents:⁴

[J306 Automotive Gear Lubricant Viscosity Classification](#)

[J2360 Lubricating Oil, Gear Multipurpose \(Metric\) Military Use](#)

¹ This specification is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.B0 on Automotive Lubricants.

Current edition approved May 1, 2013; May 1, 2019. Published May 2013; June 2019. Originally approved in 2008. Last previous edition approved in 2008 as D7450 – 08; D7450 – 13. DOI: 10.1520/D7450-13.10.1520/D7450-19.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://www.dodssp.daps.mil>; <http://www.dodssp.daps.mil>

⁴ Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.

*A Summary of Changes section appears at the end of this standard

3. Terminology

3.1 Definitions:

3.1.1 *ridging, n—on ring and pinion gears*, an alteration of the tooth surface to give a series of parallel raised and polished ridges running diagonally in the direction of sliding motion, either partially or completely across the tooth surfaces of gears. ~~D6121~~ **D6121**

3.1.2 *rippling, n—on ring and pinion gears*, an alteration of the tooth surface to give an appearance of a more or less regular pattern resembling ripples on water or fish scales. ~~D6121~~ **D6121**

3.1.3 *pitting, n—on ring and pinion gears*, small irregular cavities in the tooth surface, resulting from the breaking out of small areas of surface metal. ~~D6121~~ **D6121**

3.1.4 *spalling, n—on ring and pinion gears*, the breaking out of flakes of irregular area of the tooth surface, a condition more extensive than pitting. ~~D6121~~ **D6121**

3.1.5 *scoring, n—on ring and pinion gears*, the rapid removal of metal from the tooth surfaces caused by the tearing out of small contacting particles that have welded together as a result of metal-to-metal contact. The contact; the scored surface is characterized by a matte or dull finish. ~~D6121~~ **D6121**

3.1.6 *wear, n—on ring and pinion gears*, the removal of metal, without evidence of surface fatigue or adhesive wear, resulting in partial or complete elimination of tool or grinding marks or development of a discernible shoulder ridge at the bottom of the contact area near the root or at the toe or heel end of pinion tooth contact area (abrasive wear). ~~D6121~~ **D6121**

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *lubrited, adj*—having its surface coated with phosphate.

TABLE 1 API Category GL-5 Tests and Acceptance Criteria

Test Item	Minimum	Maximum
Test Method D7452 (formerly L-42) ^{A,B}	...	
%Scoring, Pinion		Equal to or better (lower) than the mean scoring value of the passing reference oil test results used to calibrate the stand
Drive Side		
Coast Side		
%Scoring, Ring		
Coast Side		
Test Method D6121 (formerly L-37) or D8165 using non-lubrited hardware ^{B,C}		
Ridging, ASTM merit rating	8	...
Rippling, ASTM merit rating	8	...
Wear, ASTM merit rating	5	...
Pitting/Spalling, ASTM merit rating	9.3	...
Scoring, ASTM merit rating	10	...
Test Method D7038 (formerly L-33-1) ^D		
Final rust merit rating	9.0	
Test Method D5704 ^E (formerly L-60-1) or L-60		
Viscosity Increase, percent	...	100
Pentane Insolubles, wt percent	...	3.0
Toluene Insolubles, wt percent	...	2.0
Test Method D892 , tendency		
Sequence I, mL	...	20
Sequence II, mL	...	50
Sequence III, mL	...	20
Test Method D130 ^F		
ASTM rating	...	3

^A The Canadian version of Test Method **D7452** follows the procedure of Test Method **D7452** with the modifications detailed in Annex A1, Table A1.1 of Test Method **D7452**.

^B This test may be conducted under two different sets of operating conditions, commonly referred to as Standard and Canadian. The test conditions to be used are dependent upon the viscosity grade of the lubricant under evaluation. Please see **A2.2** and **Table A2.1** for details as to which version of this test should be used in the evaluation of a specific lubricant.

^C The Canadian version of the Test Method **D6121** test and **D8165** follows the procedure of the Test Method **D6121** test and **D8165** with the modifications detailed in Test Method the respective **D6121**, Annex A6.2, Table A6.1, test method annexes.

^D Candidate fluids tested previous to the development of the Test Method **D7038** procedure using the L-33 test procedure with a cover plate merit rating of a minimum of 8 and a merit rating for all other areas of a minimum of 10 are considered acceptable results against the performance requirements of this Specification.

^E Carbon or Varnish and Sludge ratings are reported in Test Method **D5704** but are not an acceptance criterion for API Category GL-5.

^F Tested for 3 h at 250°F (121°C).