

Appendix

List of Referenced Documents

The following tables include all ASTM reference documents and updated standard test methods for engine oils, transmission lubricants, gear lubricants, and grease.

TABLE 1—Definition of Terms and Abbreviations	
AAMA	American Automobile Manufacturers Association
AMS	Aerospace Materials Specification
ANSI	American National Standards Institute
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
CEC	Coordinating European Council
CF, CF-2, CF-4, CG, CG-4, CH-4, CI-4, CJ-4	“C” represents a category for engine oils that are used in compression-ignition (diesel) engines. CF, CF-2, CF-4, CG, CG-4, CH-4, CI-4, and CJ-4, all represent a particular oil quality at different time frames used for different diesel engines. After 2006, the current diesel engine specification is CJ-4 for high-speed four-stroke engines to meet 2007 emission standards.
CR	Chloroprene Rubber
CRC	Coordinating Research Council
CRC Press	Chemical Rubber Company Press
CVT	Continuously Variable Transmission
cSt	Centistokes, a measure of viscosity
DIN	Deutsch Industries Norm (German industry standard)
EMA	Engine Manufacturers Association
EOAT	Engine Oil Aeration Test
EOFT	Engine Oil Filterability Test
EOWTT	Engine Oil Water Tolerance Test
EP	Extreme Pressure (used for lubricants that experience high pressure or high temperature)
FZG	Fahrzeug (German word for motor vehicle)
GF-1, GF-2, GF-3, GF-4, GF-5	Terms represent an engine oil quality that is defined by a series of tests that the oil must pass. GF-X series indicates the evolved engine oils performance specifications that were specified by ILSAC. At present, the ILSAC GF-5 represents the new engine oil performance requirements that aim to improve fuel economy, protection for emission control systems, and lubricant robustness for petroleum engines.
GF-5 and API SN	ILSAC GF-5 and API SN represent almost a convergence of two engine oil series in lubricant performance specifications after many years. The current ILSAC GF-5 and API SN represent the new engine oil performance requirements which aim to improve fuel economy, protection for emission control systems, and lubricant robustness for petroleum engines. It only applies to 0W(X), 5W(X), and 10W(X).
ILSAC	International Lubricant Standardization and Approval Committee
ISA	Instrument Society of America
ISO	Represents a standard from the American National Standards Institute
JAMA	Japan Automobile Manufacturers Association
MIL	Military specification

(Continued)

TABLE 1— Definition of Terms and Abbreviations (Continued)	
NBR-L	Acrylonitrile-Butadiene Rubber with Low Acrylonitrile
PC	Pre-chamber, associated with engine oil tests for diesel engines
SAE	Society of Automotive Engineers
API SF, SG, SH,	"S" represents a category for engine oils that are used in spark ignition engines. Each successive final letter represents a more recent category.
API SJ, SL, SN	SN is more recent than the others listed. It represents the new API category for improving engine oil performance like ILSAC GF-5.
TEOST	Thermo Oxidation Engine Oil Simulation Test
ZDP or ZDDP	Zinc dialkyl-dithio phosphate, an antioxidant and an anti-wear agent used as an additive in engine oil

TABLE 2—Referenced Documents in ASTM Standard Test Methods Related to Engine Oil	
ASTM No.	Test Method or Document Title
C1109	Analysis of Aqueous Leachates from Nuclear Waste Materials Using Inductively Coupled Plasma-Atomic Emission Spectrometry
D16	Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products
D56	Flash Point by Tag Closed Tester
D86	Distillation of Petroleum Products
D91	Acidity of Hydrocarbon Liquids and Their Distillation Residues
D92	Flash and Fire Points by Cleveland Open Cup
D93	Flash Point by Penske-Martens Closed Tester
D97	Pour Point of Petroleum Products
D117	Guide to Sampling Test Methods, Standard Practices, and Guides for Electrical Insulating Oils of Petroleum Origin
D129	Sulfur in Petroleum Products (General Bomb Method)
D130	Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test
D140	Practice for Sampling Bituminous Materials
D156	Saybolt Color of Petroleum Products (Saybolt Chromometer Method)
D235	Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry-cleaning Solvent)
D240	Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter
D287	API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)
D323	Vapor Pressure of Petroleum Products (Reid Method)
D341	Viscosity-Temperature Charts for Liquid Petroleum Products
D381	Existent Gum in Fuels by Jet Evaporation
D445	Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity)
D446	Standard Specifications and Operating Instructions for Glass Capillary Kinematic Viscometers
D482	Ash from Petroleum Products
D524	Ramsbottom Carbon Residue of Petroleum Products
D525	Oxidation Stability of Gasoline (Induction Period Method)
D613	Cetane Number of Diesel Fuel Oil
D664	Acid Number of Petroleum Products by Potentiometric Titration
D850	Acidity of Hydrocarbon Liquids and Their Distillation Residues
D873	Oxidation Stability of Aviation Fuels (Potential Residue Method)
D892	Foaming Characteristics of Lubricating Oils
D893	Insolubles in Used Lubricating Oils

TABLE 2—Referenced Documents in ASTM Standard Test Methods Related to Engine Oil (Continued)

ASTM No.	Test Method or Document Title
D974	Acid and Base Number by Color-Indicator Titration
D1078	Distillation Range of Volatile Organic Liquids
D1093	Acidity of Hydrocarbon Liquids and Their Distillation Residues
D1133	Kauri-Butanol Value of Hydrocarbon Solvents
D1193	Specification for Reagent Water
D1217	Density and Relative Density (Specific Gravity) of Liquids by Bingham Pycnometer
D1250	Standard Guide for Petroleum Measurement Tables
D1266	Sulfur in Petroleum Products (Lamp Method)
D1298	Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method
D1310	Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus
D1319	Hydrocarbon Types in Liquid Petroleum Products by Fluorescent Indicator Adsorption
D1353	Nonvolatile Matter in Volatile Solvents for Use in Paint, Lacquer, and Related Products
D1480	Density and Relative Density (Specific Gravity) of Viscous Materials by Bingham Pycnometer
D1481	Density and Relative Density (Specific Gravity) of Viscous Materials by Lipkin Bicapillary Pycnometer
D1552	Determination of Additive Elements in Lubricating Oils by Inductively Coupled Plasma Atomic Emission Spectrometry
D2170	Kinematic Viscosity of Asphalts (Bitumens)
D2171	Viscosity of Asphalts by Vacuum Capillary Viscometer
D2422	Standard Classification of Industrial Fluid Lubricants by Viscosity System
D2500	Cloud Point of Petroleum Products
D2509	Measurement of Load-Carrying Capacity of Lubricating Grease (Timken Method)
D2622	Sulfur in Petroleum Products by X-ray Spectrometry
D2699	Research Octane Number of Spark-Ignition Engine Fuel
D2700	Motor Octane Number of Spark-Ignition Fuel
D2709	Water and Sediment in Distillate Fuels by Centrifuge
D2782	Measurement of Extreme-Pressure Properties of Lubricating Fluids (Timken Method)
D2887	Boiling Range Distribution of Petroleum Fractions by Gas Chromatography
D2896	Base Number of Petroleum Products by Potentiometric Perchloric Acid Titration
D2982	Detecting Glycol-Base Antifreeze in Used Lubricating Oils
D3120	Trace Quantities of Sulfur in Light Liquid Petroleum Hydrocarbons by Oxidative Microcoulometry
D3231	Phosphorus in Gasoline
D3237	Lead in Gasoline by Atomic Absorption Spectrometry
D3244	Standard Practice for Utilization of Test Data to Determine Conformance with Specifications
D3338	Estimation of Heat of Combustion of Aviation Fuels
D3339	Acid Number of Petroleum Products by Semi-Micro Color Indicator Titration
D3525	Gasoline Diluent in Used Gasoline Engine Oils by Gas Chromatography
D3606	Determination of Benzene and Toluene in Finished Motor and Aviation Gasoline by Gas Chromatography
D3829	Predicting the Borderline Pumping Temperature of Engine Oils
D3941	Flash Point by the Equilibrium Method with a Closed-Cup Apparatus
D4052	Density and Relative Density of Liquids by Digital Density Meter

(Continued)

TABLE 2—Referenced Documents in ASTM Standard Test Methods Related to Engine Oil (Continued)	
ASTM No.	Test Method or Document Title
D4057	Standard Practice for Manual Sampling of Petroleum and Petroleum Products
D4175	Standard Terminology Relating to Petroleum, Petroleum Products, and Lubricants
D4177	Standard Practice for Automatic Sampling of Petroleum and Petroleum Products
D4206	Sustained Burning of Liquid Mixtures by the Setaflash Tester (Open Cup)
D4294	Sulfur in Petroleum Products by Energy-Dispersive X-ray Fluorescence Spectroscopy
D4307	Determination of Additive Elements in Lubricating Oils by Inductively Coupled Plasma Atomic Emission Spectrometry
D4485	Standard Specification for Performance of Engine Oils
D4626	Calculation of Gas Chromatographic Response Factors
D4628	Analysis of Barium, Calcium, Magnesium, and Zinc in Unused Lubricating Oils by Atomic Absorption Spectrometry
D4636	Corrosiveness and Oxidation Stability of Hydraulic Oils, Aircraft Turbine Engine Lubricants, and Other Highly Refined Oils
D4683	Measuring Viscosity at High Shear Rate and High Temperature by Tapered Bearing Simulator
D4684	Determination of Yield Stress and Apparent Viscosity of Engine Oils at Low Temperature
D4737	Calculated Cetane Index by Four Variable Equation
D4739	Base Number Determination by Potentiometric Titration
D4741	Measuring Viscosity at High Temperature and High Shear Rate by Tapered-Plug Viscometer
D4863	Determination of Lubricity of Two-Stroke-Cycle Gasoline Engine Lubricants
D4927	Elemental Analysis of Lubricant and Additive Components—Barium, Calcium, Phosphorus, Sulfur, and Zinc by Wave-length-Dispersive X-ray Fluorescence Spectroscopy
D4951	Determination of Additive Elements in Lubricating Oils by Inductively Coupled Plasma Atomic Emission Spectrometry
D5119	Test Method for Evaluation of Automotive Engine Oils in the CRC L-38 Spark-Ignition Engine
D5133	Low Temperature, Low Shear Rate, Viscosity/Temperature Dependence of Lubricating Oils Using a Temperature Scanning Technique
D5134	Detailed Analysis of Petroleum Naphthas Through n-Nonane by Capillary Gas Chromatography
D5185	Determination of Additive Elements, Wear Metals and Contaminants in Used Lubricating Oils by Inductively-Coupled Plasma Atomic Emission Spectrometry
D5186	Determination of the Aromatic Content and Polynuclear Content of Diesel Fuels and Aviation Turbine Fuels by Supercritical Fluid Chromatography
D5290	Measurement of Oil Consumption, Piston Deposits, and Wear in a Heavy-Duty High-Speed Diesel Engine-NTC-400 Procedure
D5302	Evaluation of Automotive Engine Oils for Inhibition of Deposit Formation and Wear in a Spark-Ignition Internal Combustion Engine Fueled with Gasoline and Operated Under Low-Temperature, Light-Duty Conditions
D5480	Engine Oil Volatility by Gas Chromatography
D5481	Measuring Apparent Viscosity at High-Temperature and High-Shear Rate by Multicell Capillary Viscometer
D5533	Evaluation of Automotive Engine Oils in the Sequence IIIE, Spark-Ignition Engine
D5800	Evaporation Loss of Lubricating Oils by the Noack Method
D5844	Evaluation of Automotive Engine Oils for Inhibition of Rusting (Sequence IID)
D5862	Evaluation of Engine Oils in Two-Stroke Cycle Turbo-Supercharged 6V92TA Diesel Engine
D5966	Evaluation of Diesel Engine Oils for Roller Follower Wear in Light-Duty Diesel Engine
D5967	Evaluation of Diesel Engine Oils in the T-8 Diesel Engine
D5968	Evaluation of Corrosiveness of Diesel Engine Oil at 121°
D6074	Guide for Characterizing Hydrocarbon Lubricant Base Oils

TABLE 2—Referenced Documents in ASTM Standard Test Methods Related to Engine Oil (Continued)

ASTM No.	Test Method or Document Title
D6082	High Temperature Foaming Characteristics of Lubricating Oils
D6202	Measurement of the Effects of Automotive Engine Oils on the Fuel Economy of Passenger Cars and Light-Duty Trucks in the Sequence VIA Spark Ignition Engine
D6278	Shear Stability of Polymer Containing Fluids Using a European Diesel Injector Apparatus
D6299	Applying Statistical Quality Assurance Techniques to Evaluate Analytical Measurement System Performance
D6300	Determination of Precision and Bias Data for Use in Test Methods for Petroleum Products and Lubricants
D6335	Determination of High Temperature Deposits by Thermo-Oxidation Engine Oil Simulation Test
D6417	Estimation of Engine Oil Volatility by Capillary Gas Chromatography
D6483	Evaluation of Diesel Engine Oils in the T-9 Diesel Engine
D6557	Evaluation of Rust Preventative Characteristics of Automotive Engine Oils
D7097	Standard Test Method for Determination of Moderately High Temperature Piston Deposits by Thermo-Oxidation Engine Oil Simulation Test (TEOST MHT1)
D7528	Standard Test Method for Bench Oxidation of Engine Oils by ROBO Apparatus
E1	Specification for ASTM Thermometers
E29	Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
E77	Inspection and Verification of Thermometers
E128	Maximum Pore Diameter and Permeability of Rigid, Porous Filters for Laboratory Use
E135	Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials
E178	Practice for Dealing with Outlying Observations
E191	Specification for Apparatus for Microdetermination of Carbon and Hydrogen in Organic and Organo-Metallic Compounds
E270	Terminology Relating to Liquid Penetrant Examination
E300	Practice for Sampling Industrial Chemicals
E344	Terminology Relating to Thermometry and Hydrometry
E355	Gas Chromatographic Terms and Relationships
E380	Use of the International System of Units (SI) (The Modernized Metric System)
E473	Terminology Relating to Thermal Analysis
E502	Selection and Use of ASTM Standards for the Determination of Flash Point of Chemicals by the Closed Cup Method
E594	Testing Flame Ionization Detectors Used in Gas Chromatography
E691	Conducting an Inter-laboratory Study to Determine the Precision of a Test Method
E1119	Specification for Industrial Grade Ethylene Glycol
E1500	Installing Fused Silica Open Tubular Capillary Columns in Gas Chromatographs
G40	Terminology Relating to Wear and Erosion

TABLE 3—Referenced Documents to Non-ASTM Methods for Engine Oils

Organization	Test Method or Document Title
ANSI (American National Standards Institute)	Standard MC96.1 Temperature Measurement—Thermocouples
API (American Petroleum Institute) Standard	API 1509 Engine Service Classification and Guide to Crankcase Oil Selection
Chemical Manufacturers Association	CMA Petroleum Additives Product Approval Code of Practice
Coordinating Research	CRC Rust Rating (CRC Manual No. 7)

(Continued)

TABLE 3—Referenced Documents to Non-ASTM Methods for Engine Oils (Continued)	
Organization	Test Method or Document Title
Council (CRC) Motor Rating	CRC Sludge Rating Manual (CRC Manual No. 12)
Method Manuals	CRC Varnish Rating Manual (CRC Manual No. 14) CRC Techniques for Valve Rating (CRC Manual No. 16)
Deutsches Institut für Normung (DIN)	DIN 51.581 Noack Evaporative Test DIN 1725 Specification for Aluminum Alloys DIN 12785 Specification for Glass Thermometers
Federal Test Method Standard	No. 791b—Lubricants Liquid Fuels and Related Products, Methods of Testing No. 791c—Method 3470 and No. 791, Method 5308.7
General Motors Corporation	GM9099-P Engine Oil Filterability Test (EOFT)
IEEE/ASTM (Institute of Electrical and Electronic Engineers)	SI-10 Standard for Use of International System of Units (SI): The Modern Metric System
Institute of Petroleum (IP)	IP 17 Color by the Lovibond Tintometer IP 139 Neutralization Number by Color Indicator Titration IP 146 Test for Foaming Characteristics of Lubricating Oil
ISO	Guide 25 General Requirements for the Calibration and Testing Laboratories Guide 34 Quality Systems Guidelines for the Production of Reference Materials Guide 35 Certification of Reference Material—General and Statistical Principles ISO 3104 Petroleum Products—Transparent and Opaque Liquids—Determination of Kinematic Viscosity and Calculation of Dynamic Viscosity ISO 3105 Glass Capillary Kinematic Viscometers—Specification and Operating Instructions ISO 3696 Water for Analytical Laboratory Use—Specification and Test Methods ISO 9000 Quality Management and Quality Assurance Standards—Guidelines for Selection and Use
Military Specification	MIL-L-2104, Lubricating Oil, Internal Combustion Engine, Combat/Tactical Services
SAE (Society of Automotive Engineers) Standards	J183, Engine Oil Performance and Engine Service Classification (Other Than “Energy Conserving”) J254, Instrumentation and Techniques for Exhaust Gas Emissions Measurement J300, Engine Oil Classification and J304, Engine Oil Tests J726, Air Cleaner Test Code (Includes Piezometer Ring Specifications) J1423, Passenger Car and Light-Duty Truck Energy-Conserving Engine Oil Classification J1995, Engine Power Test Code—Spark Ignition and Compression Ignition—Gross Power Rating
U.S. Federal Test Method	No. 791, Method 5308.7 Corrosiveness and Oxidative Stability of Light Oils (Metal Squares)
Standards	No. 791b Lubricants Liquid Fuels and Related Products; Methods of Testing

TABLE 4—Referenced Documents in ASTM Standard Test Methods for Transmission Fluids	
ASTM No.	Test Method or Document Title
A108	Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality
A109	Specification for Steel, Strip, Carbon, Cold-Rolled
A240/A240 M	Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
B224	Classification of Coppers
D91	Precipitation Number of Lubricating Oils
D130	Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test
D235	Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry-cleaning Solvent)
D396	Specification for Fuel Oils
D412	Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension
D445	Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
D471	Test Method for Rubber Property—Effect of Liquids
D512	Chloride Ion in Water

TABLE 4—Referenced Documents in ASTM Standard Test Methods for Transmission Fluids (Continued)

ASTM No.	Test Method or Document Title
D516	Sulfate Ion in Water
D664	Acid Number of Petroleum Products by Potentiometric Titration
D892	Foaming Characteristics of Lubricating Oils
D893	Insolubles in Used Lubricating Oils
D975	Specification for Diesel Fuel Oils
D1193	Specification for Reagent Water
D1217	Density and Relative Density (Specific Gravity) of Liquids by Bingham Pycnometer
D1401	Water Separability of Petroleum Oils and Synthetic Fluids
D1480	Density and Relative Density (Specific Gravity) of Viscous Materials by Bingham Bicapillary Pycnometer
D1481	Density and Relative Density (Specific Gravity) of Viscous Materials by Lipkin Bicapillary Pycnometer
D1655	Specification for Aviation Turbine Fuels
D1838	Copper Strip Corrosion by Liquefied Petroleum (LP) Gases
D2170	Test Method for Kinematic Viscosity of Asphalts (Bitumens)
D2171	Viscosity of Asphalts by Vacuum Capillary Viscometer
D2240	Rubber Property—Durometer Hardness
D2422	Classification of Industrial Fluid Lubricants by Viscosity System
D3603	Rust-Preventing Characteristics of Steam Turbine Oil in the Presence of Water (Horizontal Disk Method)
D4057	Manual Sampling of Petroleum and Petroleum Products
D4175	Terminology Relating to Petroleum, Petroleum Products, and Lubricants
D4177	Automatic Sampling of Petroleum and Petroleum Products
D5182	Evaluating the Scuffing (Scoring) Load Capacity of Oils (FZG Visual Method)
D5579	Evaluating the Thermal Stability of Manual Transmission Lubricants in a Cyclic Durability Test
D5662	Determining Automotive Gear Oil Compatibility with Typical Oil Seal Elastomers
D5704	Evaluation of the Thermal and Oxidative Stability of Lubricants Used for Manual Transmissions and Final Drive Axles
D5760	Performance of Manual Transmission Gear Lubricants
D6074	Guide for Characterizing Hydrocarbon Lubricant Base Oils
E1	Specification for ASTM Thermometers
E77	Inspection and Verification of Thermometers
E527	Practice for Numbering Metals and Alloys
G40	Terminology Relating to Erosion and Wear
ASTM Adjuncts	ASTM Copper Strip Corrosion Standard Engineering Drawings PCN ADJD5704

TABLE 5—Additional Standards and Specifications Related to Transmission Fluids

Organization	Test Method or Document Title
ANSI/ISA (Instrument Society of America)-S7.3	Quality Standard for Instrument Air
DIN 51 354 Teil 1	FZG Zahnrad Verspannungs Prüf Maschine—Allgemeine Arbeitsgrundlagen
Federal Specification	RRS-366 (Method 5329 of VV-L-791e) Test Sieve Sizes QQ-S-698 Steel Sheet and Strip, Low Carbon PD-680 Standard Solvent JAN-H-792 Operations of Humidity Cabinet

(Continued)

TABLE 5—Additional Standards and Specifications Related to Transmission Fluids (Continued)

Organization	Test Method or Document Title
Federal Specifications Standard No. 791C	Method 3430.2 Compatibility Characteristics of Universal Gear Lubricants Method 3440.1 Storage Solubility Characteristics of Universal Gear Lubricants
Federal Standard No. 791C, Method 3440.1	Storage Solubility Characteristics of Universal Gear Lubricants
Institute of Petroleum (IP)	Specifications—IP Standard Thermometers, Appendix A Specifications for IP Standard Reference Liquids, Appendix B BS 871 Specification for Abrasive Papers and Cloths BS 970: Part 1: Carbon and Carbon Manganese Steels Including Free Cutting Steels
ISO	Guide 25—General Requirements for the Calibration and Testing Laboratories 3104 Petroleum Products—Transparent and Opaque Liquids—Determination of Kinematic and Calculation of Dynamic Viscosity 3105 Glass Capillary Kinematic Viscometers—Specification and Operating Instructions 3696 Water for Analytical Laboratory Use—Specification and Test Methods 4021 Hydraulic Fluid Power—Particulate Contamination Analysis—Extraction of Fluid Samples from Lines of an Operating System 4406 Hydraulic Fluid Power—Fluids—Method for Coding Level of Contamination by Solids Particles 9000 Quality Management and Quality Assurance Standards—Guidelines for Selection and Use
Mack Trucks Oil, Gear	Multipurpose (GO-H)
Military Standard	MIL-L-2105 and 2105D, Lubricating Oil, Gear, Multipurpose MIL-C-15074C, Corrosion Preventive Compound Finger Print Remover MIL-C-16173D Corrosion Preventive Compound, Solvent Compound Cutback, Cold Application
SAE Standard	1009C Tee Reducer, Bulkhead on Side, Flareless Tube

TABLE 6—Referenced Documents in ASTM Standard Tests for Greases

ASTM No.	Test Method or Document Title
D88	Saybolt Viscosity
D95	Water in Petroleum Products and Bituminous Materials by Distillation
D97	Pour Point for Petroleum Oils
D130	Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test
D156	Saybolt Color of Petroleum Products (Saybolt Chromometer Method)
D217	Cone Penetration of Lubricating Grease
D235	Specifications for Mineral Spirits (Petroleum Spirits) Hydrocarbon Dry-cleaning Solvent
A240/A240M	Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
D297	Rubber Products—Chemical Analysis
D329	Specification for Acetone
D412	Vulcanized Rubber and Thermoplastic Elastomers-Tension
D445	Kinematic Viscosity of Transparent and Opaque Liquids (the Calculation of Dynamic Viscosity)
D446	Specifications and Operating Instructions for Glass Capillary Kinematic Viscometers
D471	Rubber Property—Effect of Liquids
D473	Sediment in Crude Oils and Fuel Oils by the Extraction Method
D566	Dropping Point of Lubricating Grease
D770	Specification for Isopropyl Alcohol

TABLE 6—Referenced Documents in ASTM Standard Tests for Greases (Continued)	
ASTM No.	Test Method or Document Title
D785	Rockwell Hardness of Plastics and Electrical Insulating Materials
D937	Cone Penetration of Petrolatum
D972	Evaporation Loss of Lubricating Greases and Oils
D1078	Distillation Range of Volatile Organic Liquids
D1193	Specification for Reagent Water
D1217	Density and Relative Density (Specific Gravity) of Liquids by Bingham Pycnometer
D1310	Flash Point and Fire Point of Liquids by Tag Open-Cup Apparatus
D1353	Nonvolatile Matter in Volatile Solvents for Use in Paints, Varnish, Lacquer, and Related Products
D1403	Cone Penetration of Lubricating Grease Using One-Quarter and One-Half Scale Cone Equipment
D1480	Density and Relative Density (Specific Gravity) of Viscous Materials by Bingham Pycnometer
D1481	Density and Relative Density (Specific Gravity) of Viscous Materials by Lipkin Bicapillary Pycnometer
D2170	Kinematic Viscosity of Asphalts (Bitumens)
D2171	Viscosity of Asphalts by Vacuum Capillary Viscometer
D2240	Rubber Property—Durometer Hardness
D2265	Dropping Point of Lubricating Grease Over Wide Temperature Range
D2500	Cloud Point of Petroleum Oils
D2595	Evaporation Loss of Lubricating Greases Over Wide Temperature Range
D2714	Calibration and Operation of the Falex Block-on-Ring Friction and Wear Testing Machine
D3182	Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standardized Vulcanized Sheets
D3183	Practice for Rubber—Preparation of Pieces for Test Purposes from Products
D3244	Practice for Utilization of Test Data to Determine Conformance with Specifications
D3527	Life Performance of Automotive Wheel Bearing Grease
D4175	Terminology Relating to Petroleum, Petroleum Products, and Lubricants
D4289	Elastomer Compatibility of Lubricating Greases and Fluids
D4290	Determining the Leakage Tendencies of Automotive Wheel Bearing Grease under Accelerated Conditions
D4693	Low-Temperature Torque of Grease-Lubricated Wheel Bearings
D4950	Classification of and Specification for Automotive Service Greases
D5483	Oxidation Induction Time of Lubricating Greases by Pressure Differential Scanning Calorimetry
D5706	Determining Extreme Pressure Properties of Lubricating Greases Using a High-Frequency, Linear Oscillation (SRV) Test Machine
D5707	Measuring Friction and Wear Properties of Lubricating Grease Using a High-Frequency, Linear Oscillation (SRV) Test Machine
D5969	Corrosion-Preventive Properties of Lubricating Greases in Presence of Dilute Synthetic Sea-Water Environments
D6074	Guide for Characterizing Hydrocarbon Lubricant Base Oils
D6138	Corrosion-Preventive Properties of Lubricating Greases Under Dynamic Wet Conditions (Emcor Test)
D6184	Oil Separation from Lubricating Grease (Conical Sieve Method)
D6185	Practice for Evaluating Compatibility of Binary Mixtures of Lubricating Greases
E1	Specification for ASTM Thermometers
E11	Specification for Wire-Cloth Sieves for Testing Purposes

(Continued)

TABLE 6—Referenced Documents in ASTM Standard Tests for Greases (Continued)	
ASTM No.	Test Method or Document Title
E77	Inspection and Verification of Thermometers
E220	Calibration of Thermocouples by Comparison Techniques
E230	Temperature-Electromotive Force (EMF) Tables for Standardized Thermocouples
E563	Practice for Preparation and Use of Freezing Point Reference Baths
E585	Specification for Sheathed Base-Metal Thermocouple Materials
E608	Specification for Metal-Sheathed Base-Metal Thermocouples
E691	Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
G15	Terminology Related to Corrosion and Corrosion Testing
Adjunct	ASTM Adjunct: Copper Strip Corrosion Standard, Adjunct PCN 12-401300-00
ASTM	Test Methods for Rating Motor, Diesel, and Aviation Fuels; Motor Fuels (Section I), Reference Materials and Blending Accessories (Annex 2), Reference Materials (A2.7), and Table 32; (Specification for ASTM Knock Test Reference Fuel, n-heptane)

TABLE 7—Additional Standards and Specifications Related to Greases	
Organization	Test Method or Document Title
ABMA (American Bearing Manufacturers Association)	Standard 4. Tolerance Definitions and Gaging Practices for Ball and Roller Bearings
AFBMA (Anti-Friction Bearing Manufacturers Association)	Standard 19 1974 (available from ANSI, American National Standards Institute, B.3.19-1975)
ANSI (American National Standards Institute)	Specification B3.12 for Metal Balls ANSI/AFBMA Standard 20–1987 Radial Bearings of Ball, Cylindrical, Roller, and Spherical-Roller Type—Metric Designs (AFBMA Code 20BCO2JO)
British Standards Institute	BS970: 1983 Part I, Section 5
Compressed Gas Association	Booklets G-4 and G-4-1
Federal Test Method	Standard 791C, Method 3603.5, Swelling of Synthetic Rubbers
IP (Institute of Petroleum)	Specification for Standard IP Thermometers IP 50, Method of Testing for Cone Penetration of Lubricating Grease
ISO (American National Standards Institute)	Guide 25—General Requirements for the Calibration and Testing Laboratories 3104 Petroleum Products—Transparent and Opaque Liquids—Determination of Kinematic Viscosity and Calculation of Dynamic Viscosity 3105 Glass Capillary Kinematic Viscometers—Specification and Operating Instructions 3696 Water for Analytical Laboratory Use—Specification and Test Methods 9000 Quality Management and Quality Assurance Standards—Guidelines for Selection and Use
Military Standard	MIL-G-10924F, Specification for Automotive and Artillery
NLGI (National Lubricating Grease Institute)	Grease Consistency Specification
SAE (Society of Automotive Engineers) Standard	AMS (Aerospace Materials Specification) 3217A Standard Elastomer Stocks-Test Slabs AMS 3217/2A Test Slabs, Acrylonitrile AMS 3217/3A Test Slabs, Chloroprene (CR)-65-75 Butadiene (NBR-L)-Low Acrylonitrile, 65-75
U.S. Air Force	Specification 539, Specification Bulletin for Standard Elastomer Stocks

TABLE 8—Referenced Documents in ASTM Standards Related to Gear Lubricants

ASTM No.	Test Method or Document Title
B16	Specification for Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines
D96	Water and Sediment in Crude Oil by Centrifuge Method (Field Procedure)
D130	Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test
D235	Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry-cleaning Solvents)
D329	Specification for Acetone
D341	Viscosity-Temperature Charts for Liquid Petroleum Products
D396	Specification for Fuel Oils
D412	Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension
D446	Specifications and Operating Instructions for Glass Capillary Kinematic Viscometers
D471	Rubber Property—Effect of Liquids
D484	Specification for Hydrocarbon Dry-cleaning Solvents
D892	Foaming Characteristics of Lubricating Oils
D975	Specification for Diesel Fuel Oils
D1193	Specification for Reagent Water
D1217	Density and Relative Density (Specific Gravity) of Liquids by Bingham Pycnometer
D1480	Density and Relative Density (Specific Gravity) of Viscous Materials by Bingham Pycnometer
D1481	Density and Relative Density (Specific Gravity) of Viscous Materials by Lipkin Bicapillary Pycnometer
D1655	Specification for Aviation Turbine Fuels
D1796	Water and Sediment in Fuel Oils by Centrifuge Method (Laboratory Procedure)
D1838	Copper Strip Corrosion by Liquefied Petroleum (LP) Gases
D2170	Viscosity of Asphalts (Bitumens)
D2171	Viscosity of Asphalts by Vacuum Capillary Viscometer
D2240	Rubber Property—Durometer Hardness
D2266	Wear Preventive Characteristics of Lubricating Fluid (Four-Ball Method)
D2509	Measurement of Load-Carrying Capacity of Extreme Lubricating Grease (Timken Method)
D2670	Wear Properties of Fluid Lubricants (Falex Pin and Vee Block Method)
D2783	Measurement of Extreme Pressure Properties of Lubricating Fluids (Four-Ball Method)
D4175	Terminology Relating to Petroleum, Petroleum Products, and Lubricants
D5182	Evaluating the Scuffing (Scoring) Load Capacity of Oils
D5579	Evaluating the Thermal Stability of Manual Transmission Lubricants In a Cyclic Durability Test
D5662	Determining Automotive Gear Oil Compatibility with Typical Oil Seal Elastomers
D5704	Evaluation of the Thermal and Oxidative Stability of Lubricating Oils Used for Manual Transmissions and Final Drive Axles
D5760	Specification for Performance of Manual Transmission Gear Lubricants
D6074	Guide for Characterizing Hydrocarbon Lubricant Base Oils
D7450	Standard Specification for Performance of Rear Axle Gear Lubricants Intended for API Category GL-5 Service 1
E1	Specification for ASTM Thermometers
E128	Maximum Pore Diameter and Permeability of Rigid, Porous Filters for Laboratory Use
G40	Terminology Relating to Erosion and Wear
ASTM	Three Glossy Prints of Test Blocks Showing Scars (D 2780)
Adjuncts	ASTM Copper Strip Corrosion Protection

TABLE 9—Additional Standards Related to Gear Lubricants	
Organization and Test No.	Test Method or Document Title
ANSI (American National Standards Institute) B3.12	Specification for Metal Balls
DIN (Deutsch Industries Norm)	FZG Zahnrad Verspannungs Pruef Maschine—Allgemeine Arbeitsgrundlagen
51 354 Teil (Part)	1
Federal Standard No 791 C	Method 3430.2 Compatibility Characteristics of Universal Gear Lubricants Method 3440.1 Storage Solubility Characteristics of Universal Gear Lubricants
Institute of Petroleum Standards	Color measured using the Lovibond Tintometer
ISO	Guide 25—General Requirements for the Calibration and Testing Laboratories 3104 Petroleum Products—Transparent and Opaque Liquids—Determination of Kinematic Viscosity and Calculation of Dynamic Viscosity 3105 Glass Kinematic Capillary Viscometers—Specifications and Operating Instructions 3696 Water for Analytical Laboratory Use—Specification and Test Methods 9000 Quality Management and Quality Assurance Standards—Guidelines for Selection and Use
Mack Trucks, Inc.	GO-H, Oil, Gear: Multipurpose
Military Standard	MIL-L-2105, Lubricating Oil, Gear, Multipurpose
SAE (Society of Automotive Engineers)	J308 Axle and Manual Transmission Lubricants

TABLE 10—ASTM Standard Test Methods Related to Brake Fluids	
D91	American Automobile Manufacturers Association
D260	Standard Recommended Practice for General Gas Chromatography Procedure
D344	Method of Test for Relative Dry Hiding Power of Paints
D395	Aerospace Materials Specification
D412	Rubber Properties in Tension
D445	Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
D664	Neutralization Number of Potentiometric Titration
D746	Brittleness
D1120	Method of Test for Boiling Point of Engine Antifreezes
D1209	Color of Clear Liquids (Platinum-Cobalt Pigments)
D1364	Water in Volatile Solvents (Fischer Reagent Titration Method)
D1415	Method of Test for International Hardness of Vulcanized Natural Rubber and Synthetic Rubbers
D2240	Rubber Property—Durometer Hardness
D3182	Recommended Practice for Rubber-Materials, Equipment and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets
D3185	Methods for Rubber-Evaluation of SBR (Styrene-Butadiene Rubber) including Mixtures with Oil
E1	Specification for ASTM Thermometers
E145	Specification for Gravity-Convection and Forced-Ventilation Ovens
E260–73	Standard Recommended Practice for General Gas Chromatography Procedure