



## Test Monitoring Center

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D4485 Information Letter 19-7  
Sequence Number 7  
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***ASTM consensus has not been obtained on this information letter. An appropriate ASTM ballot will be issued in order to achieve such consensus.***

TO: D4485 Mailing List

SUBJECT: 1. Replace Table X4.1 with updated copy of Requirements for API Category SM  
2. Update Table 1 API SJ Category with alternate Test Requirements  
3. Update Table 1 API SL Category with alternate Test Requirements

On July 9, 2019 the D44585 Surveillance Panel approved updates to Category SJ, SL, and SM tables in ASTM Specification D4485. The following lists the changes

1. The existing table X4.1 was replaced with copy from API 1509 18<sup>th</sup> Edition
2. Table 1 SJ Category was updated with alternate test type requirements.
3. Table 1 SL Category was updated with alternate test type requirements.

The text of the revisions is shown in the attachment. These changes are effective with the issuance of this information letter.

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Chairman  
ASTM Subcommittee B

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Attachment

c: [http://www.astmtmc.cmu.edu/ftp/docs/d4485/IL\\_19-7\\_D4485.pdf](http://www.astmtmc.cmu.edu/ftp/docs/d4485/IL_19-7_D4485.pdf)

Distribution: Email

TABLE X4.1 Requirements for API Service Category SM

Engine Test Requirements <sup>a</sup>	Viscosity Grade	
	Performance Requirements	
	SAE 0W-20, SAE 5W-20, SAE 0W-30, SAE 5W-30, SAE 10W-30	All Others <sup>b</sup>
ASTM D7320 (Sequence IIIG)		
Kinematic viscosity increase @ 40°C, %	150 (max)	150 (max)
Average weighted piston deposits, merits	3.5 (min)	3.5 (min)
Hot stuck rings	None	None
Average cam plus lifter wear, µm	60 (max)	60 (max)
Or		
ASTM D8111 (Sequence IIIH)		
Kinematic viscosity increase @ 40°C, %	150 (max)	150 (max)
Average weighted piston deposits, merits	3.2 (min)	3.2 (min)
Hot stuck rings	None	None
ASTM D4684 (Sequence IIIGA), ASTM D8111 (Sequence IIIHA), or ASTM D7528 (ROBO)		
Evaluate EOT oil from ASTM Sequence IIIGA, Sequence IIIHA, or ROBO test with ASTM D4684 (MRV TP-1)	ASTM D4684 viscosity of EOT sample must meet requirements of original grade or next higher grade	NR
ASTM D6891 (Sequence IVA)		
Average cam wear (7 position avg.), µm	90 (max)	90 (max)
ASTM D6593 (Sequence VG) <sup>c</sup>		
Average engine sludge, merits	7.8 (min)	7.8 (min)
Average rocker cover sludge, merits	8.0 (min)	8.0 (min)
Average engine varnish, merits	8.9 (min)	8.9 (min)
Average piston skirt varnish, merits	7.5 (min)	7.5 (min)
Oil screen sludge, % area	20 (max)	20 (max)
Oil screen debris, % area	Rate & report	Rate & report
Hot-stuck compression rings	None	None
Cold stuck rings	Rate & report	Rate & report
Oil ring clogging, % area	Rate & report	Rate & report
Follower pin wear, cyl #8, avg, µm	Rate & report <sup>d</sup>	Rate & report <sup>d</sup>
Ring gap increase, cyl #1 and #8, avg, µm	Rate & report <sup>d</sup>	Rate & report <sup>d</sup>
Or		
ASTM D8256 (Sequence VH)		
Average engine sludge, merits	7.4	7.4
Average rocker cover sludge, merits	7.4	7.4
Average engine varnish, merits	8.6	8.6
Average piston skirt varnish, merits	7.6	7.6
Oil screen clogging, % area	Rate & report	Rate & report
Hot stuck compression rings	None	None
ASTM D6709 (Sequence VIII)		
Bearing weight loss, mg	26 (max)	26 (max)

Bench Test and Measured Parameter <sup>a</sup>	Viscosity Grade Performance Requirements	
	SAE 0W-20, SAE 5W-20, SAE 0W-30, SAE 5W-30, SAE 10W-30	All Others <sup>b</sup>
ASTM D6557 (Ball Rust Test), avg. gray value, min <sup>c</sup>	100	100
ASTM D5800, evaporation loss, 1 hour at 250°C, % max <sup>e</sup>	15	15
ASTM D6417, simulated distillation at 371°C, % max	10	10
ASTM D6795, EOFT, % flow reduction, max	50	50
ASTM D6794, EOWTT, % flow reduction, max		
with 0.6% H <sub>2</sub> O	50	50
with 1.0% H <sub>2</sub> O	50	50
with 2.0% H <sub>2</sub> O	50	50
with 3.0% H <sub>2</sub> O	50	50
ASTM D4951 or <b>D5185</b> , phosphorus % mass, ma <sup>f</sup>	0.08 <sup>f</sup>	NR
ASTM D4951 or <b>D5185</b> , phosphorus % mass, min <sup>f</sup>	0.06 <sup>g</sup>	0.06 <sup>g</sup>
ASTM D4951, <b>D5185</b> , or D2622, sulfur % mass, max <sup>f</sup>		
SAE 0W-20, 0W-30, 5W-20, and 5W-30	0.5 <sup>g</sup>	NR
SAE 10W-30	0.7 <sup>g</sup>	NR
ASTM D892 (Option A), foaming tendency		
Sequence I, mL, max, tendency/stability <sup>h</sup>	10/0	10/0
Sequence II, mL, max, tendency/stability <sup>h</sup>	50/0	50/0
Sequence III, mL, max, tendency/stability <sup>h</sup>	10/0	10/0
D6082 (Option A), high-temperature foaming mL, max, tendency/stability <sup>i</sup>	100/0	100/0
ASTM D6922, homogeneity and miscibility	j	j
ASTM D6709, (Sequence VIII) shear stability	k	k
ASTM D7097, TEOST MHT, high temperature deposits, deposit wt, mg, max <sup>f</sup>	35	45
ASTM D5133, gelation index, max <sup>c</sup>	12 <sup>l</sup>	NR
<b>ASTM D4683, D4741, or D5481, High Temp./High Shear Viscosity @ 150°C, mPa·s, min</b>	<b>NR</b>	<b>2.6</b>

Note: All oils must meet the requirements of the most recent edition of SAE J300; NR = Not required.

<sup>a</sup>Tests and limits are per ASTM D4485.

<sup>b</sup>Does not include SAE 0W-16 and 5W-16.

<sup>c</sup>If CI-4, CJ-4, **CK-4 and/or FA-4** categories precede the "S" category and there is no API Certification Mark, the Sequence VG (ASTM D6593), Ball Rust (ASTM D6557), and Gelation Index (ASTM D5133) tests are not required.

<sup>d</sup>**ASTM Surveillance Panel will review statistics annually.**

<sup>e</sup>Calculated conversions specified in ASTM D5800 are allowed.

<sup>f</sup>For all viscosity grades: If CH-4, CI-4 and/or CJ-4 categories precede the "S" category and there is no API Certification Mark, the "S" category limits for phosphorus, sulfur, and the TEOST MHT do not apply. **However, the CJ-4 limits for phosphorus and sulfur do apply for CJ-4 oils. This footnote cannot be applied if CK-4 or FA-4 is also claimed.** Note that these "C" category oils have been formulated primarily for diesel engines and may not provide all of the performance requirements consistent with vehicle manufacturers' recommendations for gasoline-fueled engines.

<sup>g</sup>This is a non-critical specification as described in ASTM D3244.

<sup>h</sup>After 10-minute settling period.

<sup>i</sup>After 1-minute settling period.

<sup>j</sup>Shall remain homogenous and, when mixed with ASTM reference oils, shall remain miscible.

<sup>k</sup>Ten-hour stripped kinematic viscosity must remain in original SAE viscosity grade except XW-20 which must remain  $\geq 5.6$  mm<sup>2</sup>/s.

<sup>l</sup>To be evaluated from -5°C to temperature at which 40,000 cP is attained or -40°C, or 2 Celsius degrees below the appropriate MRV TP-1 temperature (defined by SAE J300), whichever occurs first.

TABLE 1 S Engine Oil Categories

Required Test Method	API SJ Category			
	Engine Test Method	Rated or Measured Parameter	Primary Performance Criteria	
Sequence IID (D5844 <sup>A,B</sup> ) or D6557 <sup>A</sup> (Ball Rust Test)	D5844	Average engine rust rating, <sup>C</sup> min Number stuck lifters	8.5 none	
	D6557	Average gray value, min	100	
Sequence IIIE (D5533 <sup>B,D</sup> ) or Sequence IIIF (D6984 <sup>D</sup> ) or Sequence IIIG (D7320 <sup>A</sup> ) or Sequence IIIH (D8111 using Sequence IIIH 60/70 Hour Guideline)	D5533	Hours to 375 % kinematic viscosity increase at 40 °C, min	64	
		Average engine sludge rating, <sup>C</sup> min	9.2	
		Average piston skirt varnish rating, <sup>C</sup> min	8.9	
		Average oil ring land deposit rating, <sup>C</sup> min	3.5	
		Lifter sticking	none	
		Scuffing and wear		
		Cam or lifter scuffing	none	
		Cam plus lifter wear, μm	Average, max	30
			Maximum, max	64
		Ring sticking (oil-related) <sup>F</sup>	none	
	D6984	Kinematic viscosity, % increase at 40 °C, max	325 <sup>F</sup>	
		Average piston skirt varnish rating, <sup>C</sup> min	8.5 <sup>G</sup>	
		Weighted piston deposit rating, <sup>H</sup> min	3.2 <sup>G</sup>	
		Screened average cam-plus-lifter wear, μm, max	20 <sup>G,I</sup>	
	D7320	Hot stuck rings	none <sup>G</sup>	
		Kinematic viscosity, % increase at 40 °C, max	150	
		Weighted piston deposit rating, <sup>K</sup> min	3.5	
		Cam-plus-lifter wear avg, μm, max	60	
	D8111 (60/70 Hour Guideline)	Hot stuck rings	none	
		60h kinematic viscosity, % increase at 40°C	307 (max)	
70h average weighted piston deposits, <sup>H</sup> , merits		2.5 (min)		
Sequence VE (D5302 <sup>B,L</sup> ) or Sequence IVA (D6891 <sup>L</sup> ) plus Sequence VG (D6593 <sup>L</sup> ) Or Sequence IVA (D6891 <sup>L</sup> ) plus Sequence VH (D8256 <sup>L</sup> )	D5302	70h average piston skirt varnish, <sup>C</sup> , merits	7.5 (min)	
		Average engine sludge rating, <sup>C</sup> min	9.0	
		Rocker arm cover sludge rating, <sup>C</sup> min	7.0	
		Average piston skirt varnish rating, <sup>C</sup> min	6.5	
		Average engine varnish rating, <sup>C</sup> min	5.0	
		Oil ring clogging, %	report	
		Oil screen clogging, %, max	20.0	
		Compression ring sticking (hot stuck)	none	
	Cam wear, μm	Average, max	127	
		Maximum, max	380	
	D6891	Average cam wear, μm <sup>M</sup>	120	
	D6593	Average engine sludge rating, <sup>C</sup> min	7.8	
		Rocker arm cover sludge rating, <sup>C</sup> min	8.0	
		Average piston skirt varnish rating, <sup>C</sup> min	7.5	
Average engine varnish rating, <sup>N</sup> min		8.9		
Oil screen clogging, %, max		20		
Hot stuck compression rings		none		
D8256	Average engine sludge rating, <sup>C</sup> min	7.4		
	Average rocker arm cover sludge rating, <sup>C</sup> min	7.4		
	Average engine varnish rating, <sup>N</sup> min	8.6		
	Average piston skirt varnish rating, <sup>C</sup> min	7.4		
	Oil screen clogging, % area	report		
	Hot stuck compression rings	none		
L-38 (D5119 <sup>O</sup> ) or Sequence VIII (D6709 <sup>O</sup> )	D5119	Bearing weight loss, mg, max	40	
		Shear stability	<sup>P</sup>	
	D6709	Bearing weight loss, mg, max	26.4	
		Shear stability	<sup>P</sup>	

Bench Test and Measured Parameter	Viscosity Grade Performance Criteria	
	SAE 0W-20, SAE 5W-20, SAE 5W-30, SAE 10W-30	All Others
Test Method D4683, D4741, D5481, high temperature/high shear viscosity @ 150 °C, mPa·s, min <sup>Q</sup>	NR	2.6
Test Method D6557 (Ball Rust Test), average gray value, min	100	100
Test Method D5800 volatility loss, % max <sup>R</sup>	22	20 <sup>S</sup>

## API SJ Category

Required Test Method	Engine Test Method	Rated or Measured Parameter	Primary Performance Criteria
Test Method <b>D6417</b> volatility loss at 371 °C, % max <sup>R</sup>		17	15 <sup>S</sup>
Test Method <b>D5480</b> volatility loss at 371 °C, % max <sup>R</sup>		17	15 <sup>S</sup>
Test Method <b>D6795</b> (EOFT), % flow reduction, max		50	50
Test Method <b>D6794</b> (EOWTT), % flow reduction, max	with 0.6 % H <sub>2</sub> O	report	report
	with 1.0 % H <sub>2</sub> O	report	report
	with 2.0 % H <sub>2</sub> O	report	report
	with 3.0 % H <sub>2</sub> O	report	report
Test Method <b>D4951</b> or <b>D5185</b> , mass fraction phosphorus, %, max		0.10 <sup>T</sup>	NR <sup>U</sup>
Test Method <b>D4951</b> or <b>D5185</b> , mass fraction phosphorus, %, min (unless valid passing Test Method <b>D5302</b> results are obtained)		0.06	0.06
Test Method <b>D92</b> flash point, °C, min <sup>V</sup>		200	NR <sup>U</sup>
Test Method <b>D93</b> , or <b>D7094</b> flash point, °C, min <sup>V</sup>		185	NR <sup>U</sup>
Test Method <b>D892</b> foaming tendency (Option A)	Sequence I, max, foaming/settling <sup>W</sup>	10/0	10/0
	Sequence II, max, foaming/settling <sup>W</sup>	50/0	50/0
	Sequence III, max, foaming/settling <sup>W</sup>	10/0	10/0
Test Method <b>D6082</b> (optional blending required) Static foam, max, tendency/stability		200/50 <sup>X</sup>	200/50 <sup>X</sup>
Test Method <b>D6922</b> homogeneity and miscibility		Y	Y
Test Method <b>D6335</b> High temperature deposits (TEOST 33), deposit mass, mg, max		60	60
Test Method <b>D5133</b> Gelation Index, max		12	NR <sup>U</sup>

API SL Category			
Required Test Method	Engine Test Method	Rated or Measured Parameter	Primary Performance Criteria
Sequence IIIF (D6984 <sup>D</sup> ) or Sequence IIIG (D7320 <sup>J</sup> ) or Sequence IIIH (D8111 using Sequence IIIH (70 Hour Guideline))	D6984	Kinematic viscosity, % increase at 40 °C, max	275
		Average piston skirt varnish rating, <sup>C</sup> min	9.0
		Weighted piston deposit rating, <sup>H</sup> min	4.0
		Screened average cam-plus-lifter wear, μm, max	20 <sup>I</sup>
		Hot Stuck Rings	none
		Low temperature viscosity performance <sup>Z</sup>	report
	D7320	Kinematic viscosity, % increase at 40 °C, max	150
		Weighted piston deposit rating, <sup>K</sup> min	3.5
		Cam-plus-lifter wear avg, μm, max	60
		Hot stuck rings	none
		Low temperature viscosity performance <sup>AA</sup>	report
	D8111 (70 Hour Guideline)	70h kinematic viscosity, % increase at 40°C	181 (max)
		70h average weighted piston deposits, merits	3.3 (min)
		70h average piston skirt varnish, <sup>C</sup> , merits	7.9 (min)
	Sequence IVA (D6891)	D6891	Cam wear average, μm, <sup>M</sup> max
Sequence VE (D5302 <sup>AB,J</sup> )	D5302	Cam wear average, μm, max	127
		Cam wear max, μm, max	380
Sequence VG (D6593) or Sequence VH (D8256)	D6593	Average engine sludge rating, <sup>C</sup> min	7.8
		Rocker arm cover sludge rating, <sup>C</sup> min	8.0
		Average piston skirt varnish rating, <sup>C</sup> min	7.5
		Average engine varnish rating, <sup>M</sup> min	8.9
		Oil screen clogging, %, max	20
		Hot stuck Compression rings	none
		Cold stuck rings	report
		Oil screen debris, %	report
	D8256	Oil ring clogging, %	report
		Average engine sludge rating, <sup>C</sup> min	7.4
		Average rocker arm cover sludge rating, <sup>C</sup> min	7.4
		Average engine varnish rating, min	8.6
		Average piston skirt varnish rating, min	7.4
		Oil screen clogging, % area	report
		Hot stuck compression rings	none
Sequence VIII (D6709)	D6709	Bearing weight loss, mg, max	26.4
		Shear stability	<sup>P</sup>

Bench Test and Measured Parameter	Viscosity Grade Performance Criteria	
	SAE 0W-20 SAE 5W-20 SAE 5W-30 SAE 10W-30	All Others
Test Method D4683, D4741, or D5481, high temperature/high shear viscosity @ 150 °C, mPa-s, min <sup>Q</sup>	NR	2.6
Test Method D6557 (Ball Rust Test), average gray value, min	100	100
Test Method D5800 volatility loss, % max	15	15
Test Method D6417 volatility loss at 371 °C, % max	10	10
D6795 (EOFT), % flow reduction, max	50	50
D6794 (EOWTT), % flow reduction, max	With 0.6 % H <sub>2</sub> O	50
	With 1.0 % H <sub>2</sub> O	50
	With 2.0 % H <sub>2</sub> O	50
	With 3.0 % H <sub>2</sub> O	50
	With 3.0 % H <sub>2</sub> O	50
Test Method D4951 or D5185, mass fraction phosphorus %, max	0.10 <sup>T</sup>	NR <sup>U</sup>
Test Method D4951 or D5185, mass fraction phosphorus %, min (unless valid passing Test Method D5302 results are obtained) <sup>J</sup>	0.06	0.06
Test Method D892 foaming tendency (Option A)	Sequence I, max, foaming/settling <sup>W</sup>	10/0
	Sequence II, max, foaming/settling <sup>W</sup>	50/0
	Sequence III, max, foaming/settling <sup>W</sup>	10/0
Test Method D6082 (optional blending required) static foam max, tendency/stability	100/0 <sup>X</sup>	100/0 <sup>X</sup>
Test Method D6922 homogeneity and miscibility	<sup>Y</sup>	<sup>Y</sup>
Test Method D7097 high temperature deposits (TEOST MHT-4), deposit mass, mg, max	45	45
Test Method D5133 (Gelation Index), max <sup>AC</sup>	12 <sup>AD</sup>	12 <sup>AD</sup>

- <sup>A</sup> Demonstrate passing performance in either Test Method **D5844** or **D6557**.
- <sup>B</sup> Monitoring of this test method was discontinued in June 20, 2001. Valid test results shall predate the end of the last calibration period for the test stand in which this test method was conducted.
- <sup>C</sup> ASTM Deposit Rating Manual 20, available from ASTM Customer Relations, ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
- <sup>D</sup> Demonstrate passing performance in either Test Method **D5533** or **D6984**. However, an oil passing Test Method **D6984** and containing less than 0.08 % mass phosphorus in the form of ZDDP shall also pass the wear limits in Test Method **D5302** (see also footnote <sup>J</sup>).
- <sup>E</sup> An oil-related stuck ring occurs on a piston with an individual oil ring land deposit rating <2.6.
- <sup>F</sup> Determine at 60 h.
- <sup>G</sup> Determine at 80 h.
- <sup>H</sup> Determine weighted piston deposits by rating the following piston areas and applying the corresponding weightings: undercrown, 10 %; second land, 15 %; third land, 30 %; piston skirt, 10 %; first groove, 5 %; second groove, 10 %; and third groove, 20 %. Use ASTM Deposit Rating Manual 20 for all ratings.
- <sup>I</sup> Calculate by eliminating the highest and lowest cam-plus-lifter wear results and then calculating an average based on the remaining ten rating positions.
- <sup>J</sup> For oils containing at least 0.06 % mass phosphorus in the form of ZDDP, demonstrating passing performance in the Sequence IIIG test obviates the need to also conduct Test Method **D5302** (Sequence VE), which was previously required for oils with less than 0.08 % mass phosphorus.
- <sup>K</sup> Unlike the Sequence IIIF test, piston skirt varnish rating is not required in the Sequence IIIG test.
- <sup>L</sup> Demonstrate passing performance in Test Method **D5302**, or alternatively, in both Test Method **D6891** and Test Method **D6593**, or both Test Method **D6891** and Test Method **D8256**.
- <sup>M</sup> Determine cam wear according to Test Method **D6891**. Seven wear measurements are made on each cam lobe and the seven measured values are added to obtain an individual cam lobe wear result. The overall cam wear value is the average of the twelve individual cam lobe wear results.
- <sup>N</sup> Determine the average engine varnish rating by averaging the piston skirt, right rocker arm cover, and left rocker arm cover varnish ratings. Use ASTM Deposit Rating Manual 20 for all ratings.
- <sup>O</sup> Demonstrate passing performance in either Test Method **D5119** or **D6709**.
- <sup>P</sup> Ten-hour stripped kinematic viscosity (oil shall remain in original viscosity grade).
- <sup>Q</sup> Minimum high temperature/high shear viscosity @ 150 °C for these viscosity grades as defined in SAE J300.
- <sup>R</sup> Meet the volatility requirement in either Test Method **D5800**, **D5480**, or **D6417**.
- <sup>S</sup> Passing volatility loss only required for SAE 15W-40 oils.
- <sup>T</sup> This is a noncritical specification as described in Practice **D3244**.
- <sup>U</sup> NR stands for Not Required.
- <sup>V</sup> Meet either Test Methods **D92**, **D93**, , or **D7094** flash point requirement.
- <sup>W</sup> Determine settling volume, in mL, at 10 min.
- <sup>X</sup> Determine settling volume, in mL, at 1 min.
- <sup>Y</sup> Homogeneous with SAE reference oils.
- <sup>Z</sup> Evaluate the 80 h test oil sample by Test Method **D4684** at the temperature indicated by the low temperature grade of oil as determined on the 80 h sample by Test Method **D5293**.
- <sup>AA</sup> Measure the viscosity of the EOT oil sample by Test Method **D4684**. The measured viscosity shall meet the requirements of the original grade or the next higher grade. The EOT sample can be either from a Sequence IIIG or a Sequence IIIGA test. (A Sequence IIIGA test is identical to a Sequence IIIG test, except only low temperature viscosity performance is measured.) Additional details are provided in the Sequence IIIG test method, in Section 13.6.
- <sup>AB</sup> Not required for oils containing a minimum of 0.08 % mass phosphorus in the form of ZDDP.
- <sup>AC</sup> Requirement applies only to SAE 0W-20, 5W-20, 0W-30, 5W-30, and 10W-30 viscosity grades.
- <sup>AD</sup> For gelation temperatures at or above the W grade pumpability temperature as defined in SAE J300.