

**Report On**  
**Sequence IIIG Evaluation**

Version IIIG VERSION 20040517 BETA

Conducted For

CC  
CC

C	V = Valid
	I = Invalid
	N = Results Cannot Be Interpreted As Representative Of Oil Performance (Non-Reference Oil) And Shall Not Be Used For Multiple Test Acceptance

CC	NR = Non-Reference Oil Test
	RO = Reference Oil Test

Test Number					
Test Stand	CCCCC	Stand Test	CCCC	Lab Test	CCCCC
Oil Code	CC				
Formulation/Stand	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC				
Alternate Codes	CCCCCCCCCCCCCCC	CCCCCCCCCCCCCCC	CCCCCCCCCCCCCCC	CCCCCCCCCCCCCCC	CCCCCCCCCCCCCCC
EOT Date	YYYYMMDD	EOT Time	HH:MM		

In my opinion this test CCCCCCC conducted in a valid manner in accordance with the latest draft of Sequence IIIG procedure and the appropriate amendments through the information letter system. The remarks included in the report describe the anomalies associated with this test.

Submitted By: CCC

Testing Laboratory

Signature Image

Signature

CC

Typed Name

CC

Title

## Form 2

### Sequence III G

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## Sequence IIIG

### Form 3

#### Summary of Test Method

The Sequence IIIG Test is a fired-engine, dynamometer lubricant test for evaluating automotive engine oils for certain high-temperature performance characteristics, including oil thickening, varnish deposition, oil consumption, and engine wear. Such oils include both single viscosity grade and multi-viscosity grade oils that are used in spark-ignition, gasoline-fueled engines, as well as diesel engines. The Sequence IIIG Test utilizes a 1996 General Motors Powertrain 3800 Series II, water-cooled, 4 cycle, V-6 engine as the test apparatus. The Sequence IIIG test engine is an overhead valve design (OHV) and uses a single camshaft operating both intake and exhaust valves via pushrods and hydraulic valve lifters in a sliding-follower arrangement. The engine uses one intake and one exhaust valve per cylinder. Induction is handled by a modified GM port fuel injection system setting the Air-to-Fuel ratio at 15:1. The test engine is overhauled prior to each test, during which critical engine dimensions are measured and rated or measured parts (pistons, camshaft, valve lifters, etc.) are replaced.

The Sequence IIIG Test consists of a 10-minute operational check, followed by 100 hours of engine operation at moderately high speed, load, and temperature conditions. The 100-hour segment is broken down into five 20-hour test segments. Following each 20-hour segment, and the 10-minute operational check, oil samples are drawn from the engine. The kinematic viscosities of the 20-hour segment samples are compared to the viscosity of the 10-minute sample to determine the viscosity increase of the test oil.

The Sequence IIIG Test is operated at the following test states during the 100-hour portion of the test:

Parameter	Set Point
Engine Speed	3600 r/min
Engine Load	250 N-m
Oil Filter Block Temperature	150 °C
Coolant Outlet Temperature	115 °C
Fuel Pressure	377.5 kPa
Intake Air Temperature	35 °C
Intake Air Pressure	0.05 kPa
Intake Air Dew Point	16.1 °C
Exhaust Back Pressure	6 kPa
Engine Coolant Flow	160 L/min
Breather Tube Coolant Flow	10 L/min
Air-to-Fuel Ratio	15.0:1
Condenser Coolant Outlet Temperature	40 °C

**Sequence III G  
Form 4**

**Test Result Summary**

Lab	CC	Oil Code	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
Stand	CCCCC	Test No.	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
Laboratory Oil Code	CCCCCCCCCCCCCCCCCCCC		
Formulation Stand Code	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		

Date Started	YYYYMMDD	Engine No.	CCCCCCCCCCCCCCCC
Time Started	HH:MM	Fuel Batch	CCCCCCCCCCCCCCCC
Date Completed	YYYYMMDD	SAE Viscosity	CCCCCC
Time Completed	HH:MM	TMC Oil Code <sup>A</sup>	CCCCCC
Test Length	S1234		

<b>Pass/Fail Results</b>			
	<b>Viscosity Increase (%)</b>	<b>Average Cam + Lifter Wear (µm)</b>	<b>Average Weighted Piston Deposits (merits)</b>
Original Units	S1234.12	S1234.1	S12.12
Transformed Results <sup>B</sup>	S12.123456	S1.1234	
Industry Correction Factor	S12.123456	S1.1234	S1.1234
Corrected Transformed	S12.123456	S1.1234	
Severity Adjustment	S12.123456	S1.1234	S1.1234
Final Transformed Result	S12.123456	S1.1234	
Final Original Unit Result	S1234.1	S1234.1	S12.12

<b>Additional Results</b>			
Oil Consumption Hours, h <sup>C</sup>	S12	Oil Consumption, L	S12.12
Maximum Cam + Lifter Wear, µm	S12345	Number of Cold-Stuck Rings	S12
Average Oil Ring Plugging, %	S1234	Number of Hot-Stuck Ring	S12
Average Piston Varnish, merits	S12.12		

<b>Most Recent Stand Reference Oil Test History<sup>D</sup></b>			
Test Number	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Oil Code	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Date Completed	YYYYMMDD	TMC Oil	CCCCCC
Final Viscosity Increase, %	S1234.1	Fuel Batch	CCCCCCCCCCCCCCCC
Final Average Cam + Lifter Wear, µm	S1234.1		
Final Average Weighted Piston Deposit, merits	S12.12		
Maximum Cam + Lifter Wear, µm	S12345		

<sup>A</sup>Reference Oil Tests Only

<sup>B</sup>Viscosity Increase uses LN(PVIS), Average Cam + Lifter Wear uses LN(ACLW), Weighted Piston Deposits does not use a transformation

<sup>C</sup>Test Hours at which Oil Consumption was calculated

<sup>D</sup>Non-Reference Oil Tests Only

## Sequence III G

### Form 5

### Operational Summary

Lab	CC	Oil Code	CC
Stand	CCCCC	Test No.	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
Laboratory Oil Code		CCCCCCCCCCCCCCCCCCCC	
Formulation Stand Code		CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC	

Controlled Parameters	Parameter	Units	QI Threshold	EOT QI	Target	Average	Standard Deviation	Number of	
								Samples	BQD
	Speed	r/min	0.000	S12.123	3600	S12345	S12.123	S12345	S12345
	Load	Nm	0.000	S12.123	250	S12345	S12.123	S12345	S12345
	Oil Filter Block	°C	0.000	S12.123	150.0	S12345	S12.123	S12345	S12345
	Engine Coolant Out	°C	0.000	S12.123	115.0	S123.1	S12.123	S12345	S12345
	Condenser Coolant Out	°C	0.000	S12.123	40.0	S123.1	S12.123	S12345	S12345
	Left Air-to-Fuel		0.000	S12.123	15.0	S12.1	S12.123	S12345	S12345
	Right Air-to-Fuel		0.000	S12.123	15.0	S12.1	S12.123	S12345	S12345
	Left Exhaust Back Pressure	kPa	0.000	S12.123	6.0	S1.12	S12.123	S12345	S12345
	Right Exhaust Back Pressure	kPa	0.000	S12.123	6.0	S1.12	S12.123	S12345	S12345
	Intake Air	kPa	0.000	S12.123	0.05	S1.12	S12.123	S12345	S12345
	Engine Coolant Flow	L/min	0.000	S12.123	160.0	S123.1	S12.123	S12345	S12345

Non-controlled Parameters	Parameter	Units	Average	Standard Deviation	Number of	
					Samples	BQD
	Oil Sump	°C	S123.1	S12.123	S12345	S12345
	Pump Outlet Pressure	kPa	S123.1	S12.123	S12345	S12345
	Gallery Pressure	kPa	S1234	S12.123	S12345	S12345
	Engine Coolant In	°C	S1234	S12.123	S12345	S12345
	Fuel Inlet	°C	S12345	S12.123	S12345	S12345
	Intake Air	°C	S12345	S12.123	S12345	S12345
	Intake Air Dew Point	°C	S123.1	S12.123	S12345	S12345
	Intake Vacuum	kPa	S12345	S12.123	S12345	S12345
	Crankcase	kPa	S1.123	S12.123	S12345	S12345
	Fuel Pressure	kPa	S1234	S12.123	S12345	S12345

Oil Consumption Data						
Hours	Initial Run-in	S12	S12	S12	S12	S12
Level (ml) low	S123	S123	S123	S123	S123	S123
Total Oil Consumed (L)		S12.12	S12.12	S12.12	S12.12	S12.12

NO <sub>x</sub> Measurement			
Hours	S12	S12	S12
NO <sub>x</sub> , ppm	S12345	S12345	S12345

## Sequence III G

### Form 6

#### Used Oil Analysis Results

Lab	CC	Oil Code	CC
Stand	CCCCC	Test No.	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
Laboratory Oil Code		CCCCCCCCCCCCCCCCCCCC	
Formulation Stand Code		CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC	

Viscosity Increase Data (cSt at 40°C)			
Hours	Viscosity <sup>A</sup>	Change	Percent
New Oil	S1234.12		
Initial <sup>B</sup>	S1234.12		
S12	S1234.12	S1234.12	S1234.12
S12	S1234.12	S1234.12	S1234.12
S12	S1234.12	S1234.12	S1234.12
S12	S1234.12	S1234.12	S1234.12
S12	S1234.12	S1234.12	S1234.12
S12	S1234.12	S1234.12	S1234.12
S1234	S1234.12	S1234.12	S1234.12

Results of ICP Analysis of Used Oil			
Hours	Iron	Copper	Lead
Initial	AAAAAA	AAAAAA	AAAAAA
S12	AAAAAA	AAAAAA	AAAAAA
S12	AAAAAA	AAAAAA	AAAAAA
S12	AAAAAA	AAAAAA	AAAAAA
S12	AAAAAA	AAAAAA	AAAAAA
S12	AAAAAA	AAAAAA	AAAAAA
S12	AAAAAA	AAAAAA	AAAAAA
S1234	AAAAAA	AAAAAA	AAAAAA

<sup>A</sup> 8000 cSt is maximum allowable viscosity  
<sup>B</sup> At end of leveling run

## Sequence III G

### Form 7

#### Valve Lifter and Camshaft Wear Results

Lab	CC	Oil Code	CC
Stand	CCCCC	Test No.	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
Laboratory Oil Code		CCCCCCCCCCCCCCCCCCCC	
Formulation Stand Code		CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC	

Number	Camshaft Lobe, $\mu\text{m}$	Valve Lifter, $\mu\text{m}$	Cam & Lifter Wear, $\mu\text{m}$
1	S1234	S1234	S1234
2	S1234	S1234	S1234
3	S1234	S1234	S1234
4	S1234	S1234	S1234
5	S1234	S1234	S1234
6	S1234	S1234	S1234
7	S1234	S1234	S1234
8	S1234	S1234	S1234
9	S1234	S1234	S1234
10	S1234	S1234	S1234
11	S1234	S1234	S1234
12	S1234	S1234	S1234
Maximum	S1234	S1234	S12345
Minimum	S1234	S1234	S12345
Average	S1234	S1234	S1234.1

## Sequence III G

### Form 8

#### Summary of Oil Ring Land Deposit Rating

Lab	CC	Oil Code	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	
Stand	CCCCC	Test No.	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	
Laboratory Oil Code		CCCCCCCCCCCCCCCCCCCC		
Formulation Stand Code		CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		
Rater	CCC	Rating Date	YYYYMMDD	

Piston	Oil Ring Land Deposit, Merits	% Chipped
1	S12.12	S1234
2	S12.12	S1234
3	S12.12	S1234
4	S12.12	S1234
5	S12.12	S1234
6	S12.12	S1234
Average	S12.12	S1.12

Piston	% Oil Ring Plugging	Ring Sticking <sup>A</sup>	
		Hot-Stuck Rings	Cold-Stuck Rings
1	S1234	CCC	CCC
2	S1234	CCC	CCC
3	S1234	CCC	CCC
4	S1234	CCC	CCC
5	S1234	CCC	CCC
6	S1234	CCC	CCC
Total		S12	S12
Average	S1234		

<sup>A</sup> Possible values    T = top compression ring  
                               B = bottom compression ring  
                               O = oil ring  
                               N = none



## Sequence IIIG

### Form 9

#### Summary of Piston Deposits

Lab	CC	Oil Code	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
Stand	CCCC	Test No.	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
Laboratory Oil Code		CCCCCCCCCCCCCCCC	
Formulation Stand Code		CC-CCCCCCCC-C-C-CCCC-CC-CC-CCCC	
Rater	CCC	Rating Date	YYYYMMDD

Note: CRC Manual 20 used for ALL Ratings

NOTE: These are un-weighted ratings

	Grooves, merits			Lands, merits		Undercrown, merits
	1	2	3	2	3	
Piston 1	S12.12	S12.12	S12.12	S12.12	S12.12	S12.12
Piston 2	S12.12	S12.12	S12.12	S12.12	S12.12	S12.12
Piston 3	S12.12	S12.12	S12.12	S12.12	S12.12	S12.12
Piston 4	S12.12	S12.12	S12.12	S12.12	S12.12	S12.12
Piston 5	S12.12	S12.12	S12.12	S12.12	S12.12	S12.12
Piston 6	S12.12	S12.12	S12.12	S12.12	S12.12	S12.12
WF	0.05	0.10	0.20	0.15	0.30	0.10

Note: These are un-weighted ratings

	Piston Skirt Varnish, merits		
	Thrust	Anti-Thrust	Average
Piston 1	S12.12	S12.12	S1.12
Piston 2	S12.12	S12.12	S1.12
Piston 3	S12.12	S12.12	S1.12
Piston 4	S12.12	S12.12	S1.12
Piston 5	S12.12	S12.12	S1.12
Piston 6	S12.12	S12.12	S1.12
Average	S12.12	S12.12	S12.12
WF			0.10

PSVAV<sub>x</sub> = (PSVT<sub>x</sub> + PSVA<sub>x</sub>)/2 where x = Number of Piston

PSVTAV = average of six Thrust Piston Skirt ratings.

PSVAAV = average of six Anti-Thrust Piston Skirt ratings.

APV = average of all 12 Piston Skirt ratings.

	Total Weighted Deposits, merits
Piston 1	S12.12
Piston 2	S12.12
Piston 3	S12.12
Piston 4	S12.12
Piston 5	S12.12
Piston 6	S12.12

$$WPD_x = (WF \cdot G1P_x) + (WF \cdot G2P_x) + (WF \cdot G3P_x) + (WF \cdot L2P_x) + (WF \cdot ORLD_x) + (WF \cdot UCP_x) + (WF \cdot PSVAV_x)$$

where: x = Number of Piston

WF = Appropriate Weighting Factor (WF) for part, from table.

Average Weighted Piston Deposits, merits	S12.12
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$$WPD = (WPD_1 + WPD_2 + WPD_3 + WPD_4 + WPD_5 + WPD_6) / 6$$

**Sequence III G**  
**Form 10**  
**Blowby Values & Plot**

Lab	CC	Oil Code	CC
Stand	CCCCC	Test No.	CC
Laboratory Oil Code	CCCCCCCCCCCCCCCCCCCC		
Formulation Stand Code	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCCC		

Blowby Plot



Test Hours	S12	S12	S12	S12	S12	S12	S12	S12	S12	S12
Blowby, L/min.	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1
Test Hours	S12	S12	S12	S12	S12	S12	S12	S12	S12	S12
Blowby, L/min.	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1	S12.1
Test Hours	S12	Average								
Blowby, L/min.	S12.1	S12.1								



**Sequence III G**  
**Form 12**  
**Hardware Information**

Lab	CC	Oil Code	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
Stand	CCCCC	Test No.	CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
Laboratory Oil Code	CCCCCCCCCCCCCCCCCCCC		
Formulation Stand Code	CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		

Build Completion Date	YYYYMMDD	Piston Batch (Code)	CCCCC
Block Serial Number	CCCCCC	Piston Size (Grade)	CC
Crankshaft Serial Number	CCCCC	Piston Ring Batch Code	CCCCC
Camshaft Serial Number	CCCCCC	Oil Filter Batch Code	CCCCC
Camshaft Batch Code	CCCCCC	Oil Cooler Batch Code	CCCCCC
Cylinder Head Serial Number, Left	CCCCCCCCCC	Valve Springs Batch Code	CCCCC
Cylinder Head Serial Number, Right	CCCCCCCCCC	Lifter Serial Number	1 CCCCCCCC
Bearing Kit Serial Number	CCCCCC		2 CCCCCCCC
Top Ring Gap, mils	S12		3 CCCCCCCC
Bottom Ring Gap, mils	S12		4 CCCCCCCC
Intake Valve Seals Batch Code	CCCCC		5 CCCCCCCC
Exhaust Valve Seals Batch Code	CCCCC		6 CCCCCCCC
Rocker Arm Batch Code	CCCCC		7 CCCCCCCC
Connecting Rod Type (CAST or PM)	CCCC		8 CCCCCCCC
			9 CCCCCCCC
			10 CCCCCCCC
			11 CCCCCCCC
			12 CCCCCCCC





