Sequence IIIF
Test Report

Version

Conducted For

	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

	NR = Non-reference oil
	RO = Reference oil

Test Number					
Test Stand		Stand Test Number		Lab Run Number	
Oil Code:					
Formulation/Stand Code					
Alternate Codes					
EOT Date		EOT Time			

In my opinion this test been conducted in a valid manner in accordance with ASTM Test Method D 6984 and the appropriate amendments through the Information Letter System. The remarks included in this report describe anomalies associated with this test.

Submitted By:

_____
Testing Laboratory

_____
Signature

_____
Typed Name

_____
Title

Sequence IIIF
Form 2

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Sequence IIIF
Form 3

Summary of Test Method

The Sequence IIIF 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 IIIF Test utilizes a 1996 General Motors Powertrain 3800 Series II, water-cooled, 4 cycle, V-6 engine as the test apparatus. The Sequence IIIF 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 IIIF Test consists of a 10-minute operational check, followed by 80 hours of engine operation at moderately high speed, load, and temperature conditions. The 80-hour segment is broken down into eight 10-hour test segments. Following each 10-hour segment, and the 10-minute operational check, oil samples are drawn from the engine. The kinematic viscosities of the 10-hour segment samples are compared to the viscosity of the 10-minute sample to determine the viscosity increase of the test oil.

The Sequence IIIF Test is operated at the following test states during the 80-hour portion of the test:

Parameter	**Set Point**
Engine Speed	3600 r/min
Engine Load	200 N·m
Oil Filter Block Temperature	155 °C
Coolant Outlet Temperature	122 °C
Fuel Pressure	365 kPa
Intake Air Temperature	27 °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
Condenser Coolant Flow	10 L/min
Air-to-Fuel Ratio	15.0:1
Condenser Coolant Outlet Temperature	40 °C

Sequence IIIF
Form 4

Test Result Summary

Laboratory		Oilcode	
Test Stand No.		Test No.	– –
Laboratory Oil Code			
Formulation Stand Code			

Date Started		Engine No.	
Time Started		Fuel Batch	
Date Completed		SAE Viscosity	
Time Completed		TMC Oil Code[A]	
Test Length			

Pass/Fail Results

	Viscosity Increase (%)	Screened Average Cam + Lifter Wear (µm)	Average Weighted Piston Deposits (merits)	Average Piston Skirt Varnish (merits)	Number of Hot Stuck Rings	Oil Consumption (L)[B]
Original Units						
Transformed Results						
Industry Correction Factor						
Corrected Transformed Result						
Severity Adjustment						
Final Transformed Result						
Final Original Unit Result						

Additional Results

Oil Consumption Hours, h		Average Oil Ring Plugging , %	
Maximum Cam + Lifter Wear, µm		Number of Cold-Stuck Rings	
Average Cam + Lifter Wear, µm			

Most Recent Stand Reference Oil Test History[C]

Test Number	– –		
Oilcode			
Date Completed		TMC Oil Code	
Final Viscosity Increase, %		Fuel Batch	
Final Average Piston Skirt Varnish, merits			
Final Screened Average Cam + Lifter Wear, µm			
Final Maximum Cam + Lifter Wear, µm			
Final Average Weighted Piston Deposit, merits			

[A] Reference Oil Tests Only

[B] Test Hours at which Oil Consumption was calculated

[C] Non-reference Oil Tests Only

Sequence IIIF
Form 5

Operational Summary

Laboratory		Oilcode	
Test Stand No.		Test No.	– –
Laboratory Oil Code			
Formulation Stand Code			

	Parameter	Units	QI Limit	EOT QI	Target	Average	Standard Deviation	Number of	
								Samples[A]	BQD[B]
Controlled Parameters	Speed	r/min	0.000		3600				
	Load	N·m	0.000		200				
	Oil Filter Block	°C	0.000		155.0				
	Engine Coolant Out	°C	0.000		122.0				
	Condenser Coolant Out	°C	0.000		40.0				
	Left Air-to-Fuel Ratio	-	0.000		15.0				
	Right Air-to-Fuel Ratio	-	0.000		15.0				
	Left Exhaust Back Pressure	kPa	0.000		6.0				
	Right Exhaust Back Pressure	kPa	0.000		6.0				
	Intake Air	kPa	0.000		0.05				
	Engine Coolant Flow	L/min	0.000		160.0				

	Parameter	Units	Average	Standard Deviation	Number of	
					Samples[A]	BQD[B]
Non-controlled Parameters	Oil Sump	°C				
	Pump Outlet Pressure	kPa				
	Gallery Pressure	kPa				
	Engine Coolant In	°C				
	Fuel Inlet	°C				
	Intake Air	°C				
	Intake Air Dew Point	°C				
	Intake Vacuum	kPa				
	Crankcase	kPa				
	Fuel Pressure	kPa				

Oil Consumption Data									
HOURS	Initial Run-in								
LEVEL (ml) low									

NO_X Measurement			
Hours			
NO_X, ppm			

Sequence IIIF
Form 6

Used Oil Analysis Results

Laboratory		Oilcode	
Test Stand No.		Test No.	– –
Laboratory Oil Code			
Formulation Stand Code			

Viscosity Increase Data (cSt @ 40°C)			
Hours	**Viscosity[A]**	**Change**	**Percent**
New Oil			
Initial[B]			

[A] 8000 cSt is maximum allowable viscosity
[B] At end of leveling run

Results of ICP Analysis of Used Oil										
Test Hours	Initial									
Iron										
Copper										
Lead										

Cold Crank Simulator Results, D5293	
Final Temperature, °C	
Final Cold-Crank Simulator Viscosity, cP	

Mini-Rotary Viscometer Results, D4684	
MRV Temperature, °C	
MRV Result, cP	
Yield Stress, cP	

Sequence IIIF
Form 7

Valve Lifter and Camshaft Wear Results

Laboratory		Oilcode	
Test Stand No..		Test No.	– –
Laboratory Oil Code			
Formulation Stand Code			

Number	Camshaft Lobe, µm	Valve Lifter, µm	Cam & Lifter Wear, µm
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
Maximum			
Minimum			
Average			
Screened Average Cam + Lifter Wear[A]			

[A] Average Cam + Lifter Wear based on ten positions, excluding the minimum and maximum positions.

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Form 8

Summary Of Oil Ring Land Deposit Ratings

Laboratory		Oilcode	
Test Stand No.		Test No.	– –
Laboratory Oil Code			
Formulation Stand Code			
Rater		Rating Date	

Piston	Oil Ring Land Deposit Rating, Merits	% Chipped
1		
2		
3		
4		
5		
6		
Average		

Piston	% Oil Ring Plugging	Ring Sticking [A]	
		Hot-Stuck Rings	Cold-Stuck Rings
1			
2			
3			
4			
5			
6			
Total			
Average			

[A] Possible values: T = top compression ring
B = bottom compression ring
O = oil ring
N = none

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Form 9

Summary Of Piston Deposits

Laboratory		Oilcode	
Test Stand No.		Test No.	– –
Laboratory Oil Code			
Formulation Stand Code			
Rater		Rating Date	

Note: CRC Manual 20 used for all ratings.

Note: These are all unweighted ratings.

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

Note: These are all unweighted ratings.

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

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

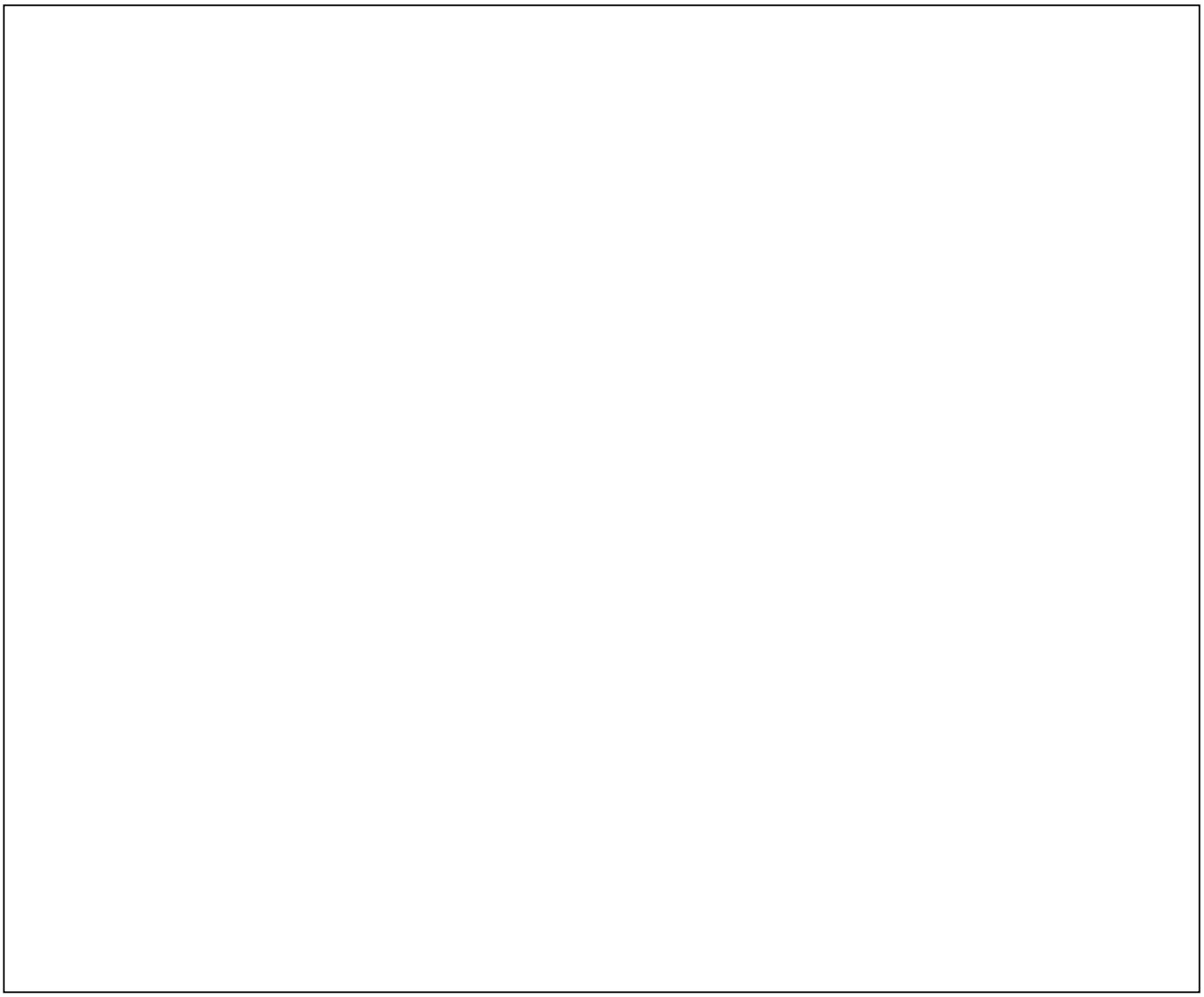
Average Weighted Piston Deposits, merits	

Sequence IIIF
Form 10

Blowby Values & Plot

Laboratory		Oilcode	
Test Stand No.		Test No.	– –
Laboratory Oil Code			
Formulation Stand Code			

Blowby Plot



Test Hours										
Blowby, L/min										
Test Hours										**Average**
Blowby, L/min										

Sequence IIIF
Form 11

Viscosity Increase Plot

Laboratory		Oilcode	
Test Stand No.		Test No.	– –
Laboratory Oil Code			
Formulation Stand Code			

Sequence IIIF
Form 12

Hardware Information

Laboratory		Oilcode	
Test Stand No.		Test No.	– –
Laboratory Oil Code			
Formulation Stand Code			

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

Sequence IIIF
Form 13

Downtime & Outlier Report Form

Lab		Oil Code	
Stand		Test No.	-- --
Laboratory Oil Code			
Formulation Stand Code			

Number of Downtime Occurrences			
Test Hours	**Date**	**Downtime**	**Reasons**
			Total Downtime (hours) – Maximum allowable downtime: 24 hours

Other Comments		
Number of Comment Lines		

Sequence IIIF
Form 13A

Downtime & Outlier Report Form

Lab		Oil Code	
Stand		Test No.	-- --
Laboratory Oil Code			
Formulation Stand Code			

Number of Downtime Occurrences			
Test Hours	**Date**	**Downtime**	**Reasons**
			Total Downtime (hours) – Maximum allowable downtime: 24 hours

Other Comments	
Number of Comment Lines	

Sequence IIIF
Form 13B

Downtime & Outlier Report Form

Lab		Oil Code	
Stand		Test No.	-- --
Laboratory Oil Code			
Formulation Stand Code			

Number of Downtime Occurrences			
Test Hours	**Date**	**Downtime**	**Reasons**
			Total Downtime (hours) – Maximum allowable downtime: 24 hours

Other Comments	
Number of Comment Lines	

Sequence IIIF
Form 14
American Chemistry Council Code Of Practice
Test Laboratory Conformance Statement

Test Laboratory					
Test Sponsor					
Formulation / Stand Code					
Test Number					
Start Date		Start Time		Time Zone	

Declarations

No. 1 All requirements of the ACC Code of Practice for which the test laboratory is responsible were met in the conduct of this test. Yes _____ No_____ *

No. 2 The laboratory ran this test for the full duration following all procedural requirements; and all operational validity requirements of the latest version of the applicable test procedure (ASTM or other), including all updates issued by the organization responsible for the test, were met.
Yes _____ No_____*

If the response to this Declaration is "No", does the test engineer consider the deviations from operational validity requirements that occurred to be beyond the control of the laboratory? Yes _____* No_____

No 3. A deviation occurred for one of the test parameters identified by the organization responsible for the test as being a special case. Yes _____* No_____ *(This currently applies only to specific deviations identified in the ASTM Information Letter System)*

Check The Appropriate Conclusion

	Operational review of this test indicates that the results should be included in the Multiple Test Acceptance Criteria calculations.
	*Operational review of this test indicates that the results should not be included in the Multiple Test Acceptance Criteria calculations.

Note: *Supporting comments are required for all responses identified with an asterisk.*

Comments

_____ _____
Signature Date

_____ _____
Typed Name Title