

**Report On**  
**Sequence IIIH Evaluation**  
 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 test
	RO = Reference oil test

Test Number					
Test Stand		Runs Since Last Calibration		Total Runs on Stand	
Oil Code					
Formulation/Stand					
Alternate Codes					
EOT Date		EOT Time			

In my opinion this test	been conducted in a valid manner in accordance with the Test Method, D8111, and appropriate amendments. The remarks included in the report describe the anomalies associated with this test.
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Submitted By:

\_\_\_\_\_

Testing Laboratory

\_\_\_\_\_

Signature

\_\_\_\_\_

Typed Name

\_\_\_\_\_

Title

**Sequence IIIH**  
**Form 2**  
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**Sequence IIIH  
Form 3  
Summary of Test Method**

The Sequence IIIH Test is a fired-engine, dynamometer lubricant test for evaluating automotive engine oils for certain high-temperature performance characteristics, including oil thickening, varnish deposition, and oil consumption. 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 IIIH Test utilizes a 2012 Chrysler Pentastar 3.6 Liter, water-cooled, 4 cycle, V-6 engine as the test apparatus. The Sequence IIIH test engine is an overhead valve design (OHV) and uses dual overhead camshafts operating both intake and exhaust valves. The engine uses two intake and two exhaust valve per cylinder. The test engine is overhauled prior to each test, during which critical engine dimensions are measured and rated or measured parts (pistons, rings, etc.) are replaced.

The Sequence IIIH Test consists 90 hours of engine operation at moderately high speed, load, and temperature conditions. The 90-hour segment is broken down into four 20-hour test segments and one 10-hour segment. Following each 20-hour segment, the 10 hour segment, and the 10-minute operational check, oil samples are drawn from the engine. The kinematic viscosities of the 20-hour segment samples and 10 hour segment samples are compared to the viscosity of the initial sample to determine the viscosity increase of the test oil.

The Sequence IIIH Test is operated at the following test states during the 90-hour portion of the test:

Parameter	Set Point
Engine Speed	3900 r/min
Engine Load	250 N·m
Oil Temperature, Block	151°C
Coolant Outlet Temperature	115°C
Fuel Temperature	30 °C
Intake Air Temperature	35 °C
Intake Air Pressure	0.05 kPa
Intake Air Dew Point	16.1 °C
Exhaust Back Pressure	4.5 kPa
Engine Coolant Flow	170 L/min
Coolant Pressure	200 kPa

## Sequence IIIH

### Form 4

#### Test Result Summary

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

Date Started		Engine No.	
Time Started		Fuel Batch	
Date Completed		SAE Viscosity	
Time Completed		Reference Oil <sup>A</sup>	
Test Length			

Pass/Fail Results				
	Viscosity Increase (%)	Average Weighted Piston Deposits (merits)	Phosphorus Retention %	Mini Rotary Viscometer Viscosity, D 4684
Original Units				
Transformed Results <sup>B</sup>				
Industry Correction Factor				
Corrected Transformed				
Severity Adjustment				
Final Transformed Result				
Final Original Unit Result				

#### Additional Results

Oil Consumption Hours, h <sup>B</sup>		Oil Consumption, L	
Average Oil Ring Plugging, %		Number of Cold-Stuck Rings	
Number of Hot-Stuck Ring		Average Piston Varnish,	

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

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

#### Cold Crank Simulator Results, D 5293

Specified Temperature, °C	
Cold-Crank Simulator Viscosity at Specified Temperature, mPa·s	
MRV Temperature, °C	
Yield Stress, Pa	

**Sequence IIIH  
Form 5  
Operational Summary**

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

	Parameter	Units	QI Threshold	EOT QI	Target	Average	Standard Deviation	Number of	
								Samples	BQD
<b>Controlled Parameters</b>	Speed	r/min	0.000		3900				
	Load	N·m	0.000		250				
	Oil, Block	°C	0.000		151				
	Coolant Out	°C	0.000		115				
	Coolant System	kPa			200				
	Intake Air	°C	0.000		35				
	Intake Air	kPa	0.000		0.05				
	Dew Point	°C	0.000		16.1				
	EBP Rt.	kPa	0.000		4.5				
	EBP Lt.	kPa	0.000		4.5				
	Fuel @ Rail	°C	0.000		30				
	Fuel @ Rail	kPa			420				
	Coolant Flow	L/min	0.000		170				

	Parameter	Units	Average	Standard Deviation	Number of	
					Samples	BQD
<b>Non-controlled Parameters</b>	Oil Sump	°C				
	Oil Pump	°C				
	Oil Cooler (Optional)	°C				
	Coolant In	°C				
	Oil Gallery	kPa				
	Oil Pump	kPa				
	Manifold Absolute Pressure	kPaA				
	Right Exhaust Temperature	°C				
	Left Exhaust Temperature	°C				
	Fuel Flow	kg/H				
	Crankcase	kPa				
	Right NOx	mg/kg				
	Left NOx	mg/kg				
	AFR, Rt.					
	AFR, Lt.					

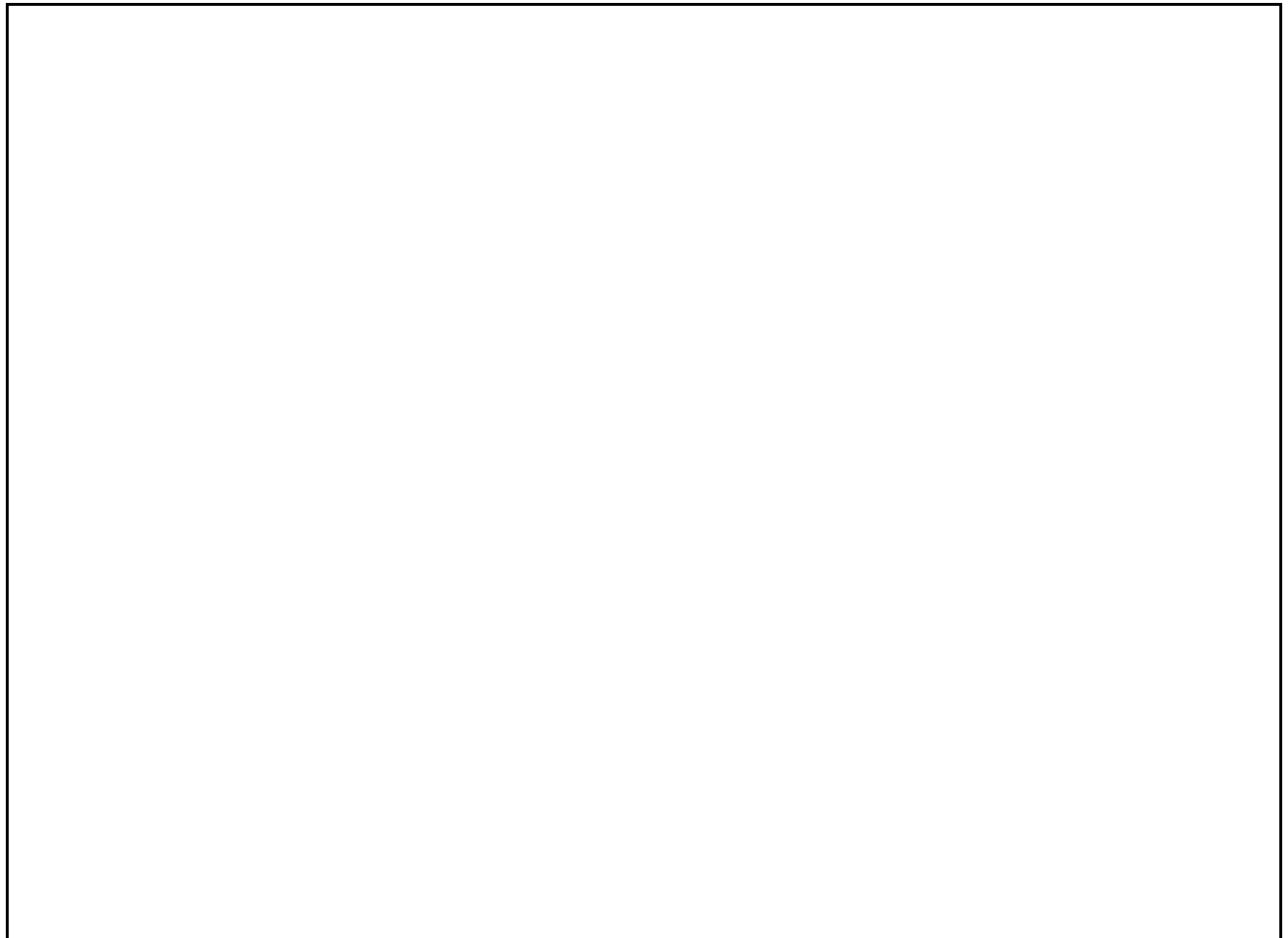
**Sequence IIIH  
Form 6  
Oil Consumption Data Plot**

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

**Oil Consumption Data**

Hours					<b>EOT</b>
Level low (mL)					
Total Oil Consumed (L)					

**Oil Consumption Plot**



## Sequence IIIH

### Form 7

#### Used Oil Analysis Results

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

<b>Viscosity Increase Data (mm<sup>2</sup>/s @40 °C)</b>			
Hours	Viscosity <sup>A</sup>	Change	Percent
New Oil			
Initial <sup>B</sup>			
EOT			

<sup>A</sup> 8000 cSt is maximum allowable viscosity

<sup>B</sup> Initial = At end of leveling run

<b>Highest Detergent Metal and Phosphorus Results by ICP (D 5185 Modified)</b>			
Test Hour	Detergent Metal	Phosphorus (P)	Phosphorus Retention <sup>C</sup>
	mg/kg	mg/kg	Percent (%)
Initial <sup>B</sup>			
EOT			
Detergent Metal used for this test			

<sup>C</sup> Phosphorus results analyzed by IIIGB Method.

**Sequence IIIH  
Form 7a  
Used Oil Analysis Results**

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

<b>Oxidation &amp; Nitration Results</b>							
Parameter	Method	20 hours	40 hours	60 hours	80 hours	EOT	
DIR Oxidation	E168 IIIG Area						
DIR Nitration	E168 IIIG Area						
<b>Total Acid Number</b>							
Parameter	Method	20 hours	40 hours	60 hours	80 hours	EOT	
TAN	D664						
TBN	D4739						
<b>Metals Element Analysis – ICP Method D5185</b>							
Element	New Oil	Initial <sup>A</sup>	20 hours	40 hours	60 hours	80 hours	EOT
Aluminum (Al)							
Boron (B)							
Calcium (Ca)							
Copper (Cu)							
Iron (Fe)							
Potassium (K)							
Magnesium (Mg)							
Manganese (Mn)							
Molybdenum (Mo)							
Sodium (Na)							
Phosphorus (P)							
Lead (Pb)							
Silicon (Si)							
Tin (Sn)							
Zinc (Zn)							

<sup>A</sup> Initial = At end of leveling run



### Sequence IIIH

### Form 8

### Summary of Ring Sticking

Lab		Oil Code		
Stand		Test No.		
Laboratory Oil Code				
Formulation Stand Code				
Rater			Rating Date	

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

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

**Sequence IIIH  
Form 9  
Summary of Piston Deposits**

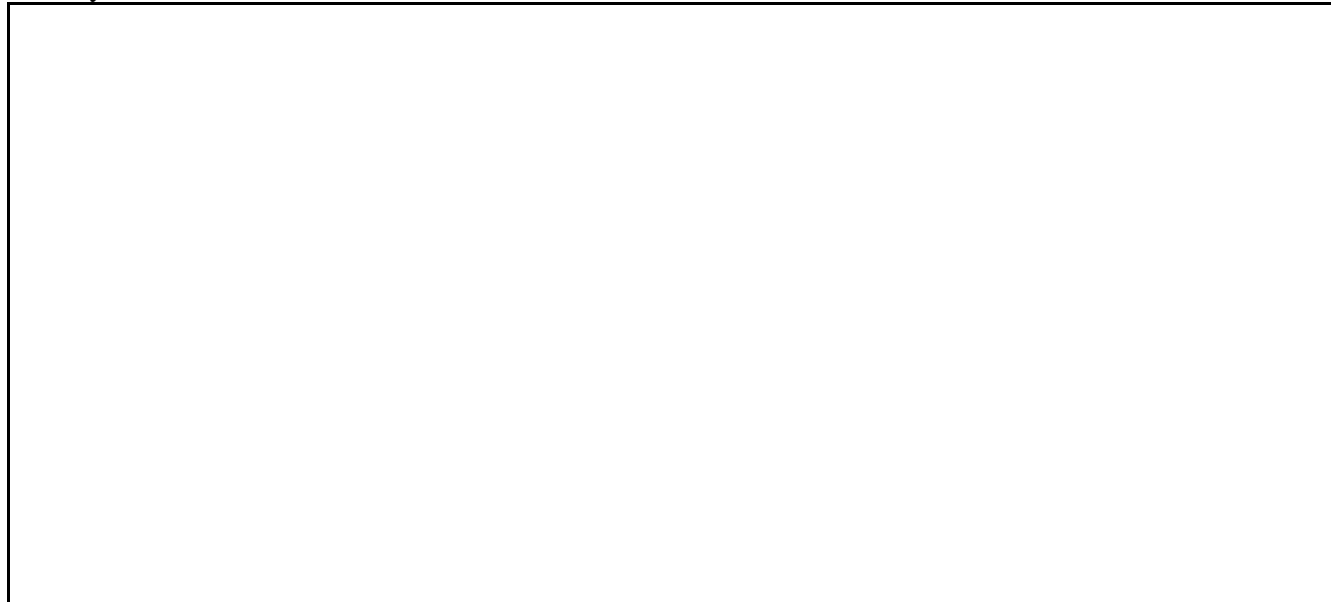
Lab		Oil Code	
Stand		Test No.	
Laboratory Oil Code			
Formulation Stand Code			
Rater		Rating Date	

<b>Un-weighted Piston Deposits, merits</b>										<b>Weighted Piston Deposits</b>	
	<b>Grooves</b>			<b>Lands</b>		<b>Undercrown</b>	<b>Piston Boss Varnish</b>				<b>Merits</b>
	1	2	3	2	3		Front	Rear	Average		
Piston 1											Piston 1
Piston 2											Piston 2
Piston 3											Piston 3
Piston 4											Piston 4
Piston 5											Piston 5
Piston 6											Piston 6
WF	0.05	0.10	0.20	0.15	0.30	0.10				0.10	Average

**Sequence IIIH  
Form 10  
Blowby Values & Plot**

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

Blowby Plot



Test Hours	Blowby, L/min	Test Hours	Blowby, L/min	Test Hours	Blowby, L/min
				<b>Average</b>	

**Sequence IIIH  
Form 11  
Viscosity Increase Plot**

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



**Sequence IIIH  
Form 12  
Hardware Information**

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

<b>Hardware Information</b>	
Engine Build Date	
Block Serial Number	
Ring Batch Code	
Oil Control (OC) Ring Batch Code	
Expander Ring (EXP) Batch Code	
Cylinder Head Serial Number, Left	
Cylinder Head Serial Number, Right	
Lab Block Number	
Piston Batch Code	

<b>Cylinder Bore Measurements</b>								
Cylinder	Transverse				Longitudinal			
	Top	Middle	Bottom	Taper	Top	Middle	Bottom	Taper
2								
4								
6								
1								
3								
5								

<b>Cylinder Surface Finish Measurements</b>					
Cylinder	Rk	Rpk	Rvk	Rz	Mr2
2					
4					
6					
1					
3					
5					

<b>Piston Ring End Gap (inches)</b>						
	2	4	6	1	3	5
Top Ring Pre-Test						
2 <sup>nd</sup> Ring Pre-Test						

Sequence IIIH  
Form 13  
Downtime Summary

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

Number of Downtime Occurrences			
Test Hours	Date	Downtime	Reasons
			<b>Total Downtime (hours) – Maximum allowable downtime: 24 hours</b>



**Sequence IIIH**  
**Form 15**  
**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)

	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