

**Sequence IIIFHD
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 | | | |

| |
|--|
| <p>In my opinion this test _____ been conducted in a valid manner in accordance with the latest draft of the Sequence IIIFHD procedure and the appropriate amendments through the Information Letter System. The remarks included in this report describe anomalies associated with this test.</p> |
|--|

Submitted By:

_____ Testing Laboratory

_____ Signature

_____ Typed Name

_____ Title

**Sequence IIIFHD
Form 2**

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Sequence IIIFHD Form 3

Summary of Test Method

The Sequence IIIFHD 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 IIIFHD Test utilizes a 1996 General Motors Powertrain 3800 Series II, water-cooled, 4 cycle, V-6 engine as the test apparatus. The Sequence IIIFHD 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 IIIFHD Test consists of a 10-minute operational check, followed by 60 hours of engine operation at moderately high speed, load, and temperature conditions. The 60-hour segment is broken down into six 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 IIIFHD Test is operated at the following test states during the 60-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 IIFHD
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 (%) |
| 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 ^B | | Oil Consumption (L) | |

| Most Recent Stand Reference Oil Test History^C | | | |
|---|--|--------------|--|
| Test Number | | | |
| Oilcode | | | |
| Date Completed | | TMC Oil Code | |
| Final Viscosity Increase, % | | Fuel Batch | |

^A Reference Oil Tests Only

^B Test Hours at which Oil Consumption was calculated

^C Non-reference Oil Tests Only

**Sequence IIFHD
Form 5
Operational Summary**

| | | | |
|------------------------|--|----------|--|
| Laboratory | | Oilcode | |
| Test Stand No. | | Test No. | |
| Laboratory Oil Code | | | |
| Formulation Stand Code | | | |

| Controlled Parameters | Parameter | Units | QI Limit | EOT QI | Target | Average | Standard Deviation | Number of | | |
|-----------------------------|----------------------------|-------|----------|--------|--------|---------|--------------------|----------------------|------------------|--|
| | | | | | | | | Samples ^A | BQD ^B | |
| | 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 | | | | | |

| Non-controlled Parameters | Parameter | Units | Average | Standard Deviation | Number of | | |
|---------------------------|----------------------|-------|---------|--------------------|----------------------|------------------|--|
| | | | | | Samples ^A | BQD ^B | |
| | 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 | | | | | | |

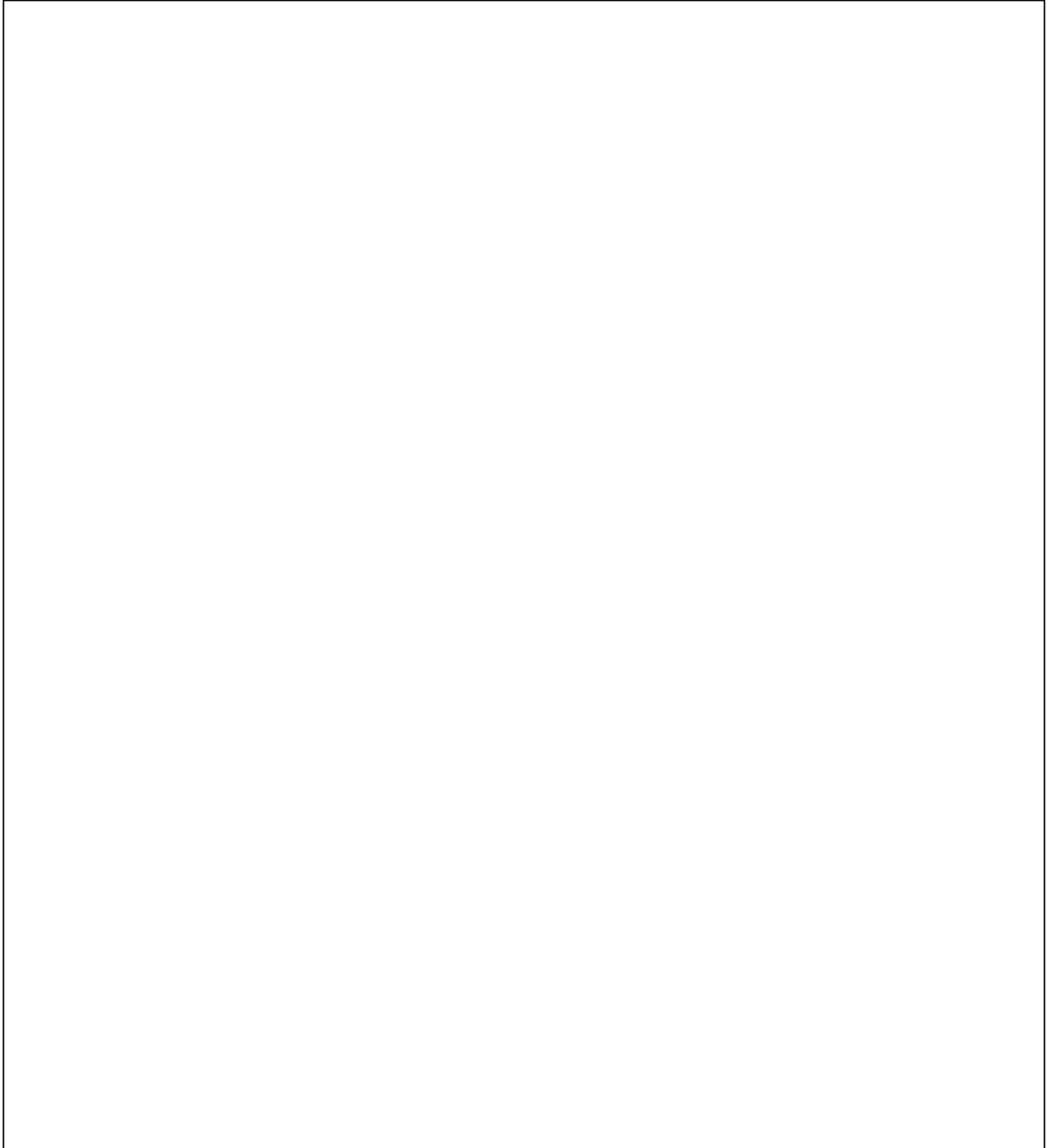
| Oil Consumption Data | | | | | | | |
|----------------------|----------------|--|--|--|--|--|--|
| HOURS | Initial Run-in | | | | | | |
| LEVEL (ml) low | | | | | | | |

| NO _x Measurement | | |
|-----------------------------|--|--|
| Hours | | |
| NO _x , ppm | | |

**Sequence IIFHD
Form 8**

Viscosity Increase Plot

| | | | |
|------------------------|--|----------|--|
| Laboratory | | Oilcode | |
| Test Stand No. | | Test No. | |
| Laboratory Oil Code | | | |
| Formulation Stand Code | | | |



**Sequence IIFHD
Form 9**

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 | | | |
| Top Ring Gap, mils | | | |
| Bottom Ring Gap, mils | | | |

**Sequence IIIFHD
Form 11
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.*

| |
|-----------------|
| <i>Comments</i> |
| |
| |
| |
| |

Signature

Date

Typed Name

Title