Sequence IIIFHD
Test Report

Version IIIFHD VERSION 20030711

Conducted For

TSTSPON1
TSTSPON2

LABVALID	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

| TSTOIL | NR = Non-reference oil |
| | RO = Reference oil |

Test Number					
Test Stand	STAND	Stand Test Number	STRUN	Lab Run Number	LABRUN
Oil Code:	OILCODE				
Formulation/Stand Code	FORM				
Alternate Codes	ALTCODE1		ALTCODE2		ALTCODE3
EOT Date	DTCOMP		EOT Time		EOTTIME

In my opinion this test OPVALID 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.

Submitted By:

SUBLAB
_____
Testing Laboratory

SUBSIGIM
_____
Signature

SUBNAME
_____
Typed Name

SUBTITLE
_____
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 IIIFHD
Form 4

Test Result Summary

Laboratory	LAB	Oilcode	OILCODE		
Test Stand No.	STAND	Test No.	STAND – STRUN – LABRUN		
Laboratory Oil Code	LABOCODE				
Formulation Stand Code	FORM				

Date Started	DTSTRT	Engine No.	ENGINENO
Time Started	STRTTI	Fuel Batch	FUELBTID
Date Completed	DTCOMP	SAE Viscosity	SAEVISC
Time Completed	EOTTIM	TMC Oil Code[A]	IND
Test Length	TESTLEN		

Pass/Fail Results	
	Viscosity Increase (%)
Original Units	PVIS
Transformed Results	TPVIS
Industry Correction Factor	PVIS_CF
Corrected Transformed Result	PVIS_COR
Severity Adjustment	PVIS_SA
Final Transformed Result	TPVISFNL
Final Original Unit Result	PVISFNL

Additional Results			
Oil Consumption Hours, h [B]	OCONH	Oil Consumption (L)	OILCON

Most Recent Stand Reference Oil Test History[C]			
Test Number	RSTANI – RSTRUN – RLABRUN		
Oilcode	ROILCODE		
Date Completed	RDTCOMP	TMC Oil Code	RIND
Final Viscosity Increase, %	RPVISFNL	Fuel Batch	RFUELBID

[A] Reference Oil Tests Only

[B] Test Hours at which Oil Consumption was calculated

[C] Non-reference Oil Tests Only

Sequence IIIFHD
Form 5

Operational Summary

Laboratory	LAB		Oilcode	OILCODE		
Test Stand No.		STAND		Test No.	STAND – STRUN – LABRUN	
Laboratory Oil Code				LABOCODE		
Formulation Stand Code				FORM		

<table>
<tr><td rowspan="12">Controlled Parameters</td><td rowspan="2">Parameter</td><td rowspan="2">Units</td><td rowspan="2">QI Limit</td><td rowspan="2">EOT QI</td><td rowspan="2">Target</td><td rowspan="2">Average</td><td rowspan="2">Standard Deviation</td><td colspan="2">Number of</td></tr>
<tr><td>Samples[A]</td><td>BQD[B]</td></tr>
<tr><td>Speed</td><td>r/min</td><td>0.000</td><td>QRPM</td><td>3600</td><td>ARPM</td><td>SRPM</td><td>NRPM</td><td>BRPM</td></tr>
<tr><td>Load</td><td>N·m</td><td>0.000</td><td>QLOAD</td><td>200</td><td>ALOAD</td><td>SLOAD</td><td>NLOAD</td><td>BLOAD</td></tr>
<tr><td>Oil Filter Block</td><td>°C</td><td>0.000</td><td>QOTEMP</td><td>155.0</td><td>AOTEMP</td><td>SOTEMP</td><td>NOTEMP</td><td>BOTEMP</td></tr>
<tr><td>Engine Coolant Out</td><td>°C</td><td>0.000</td><td>QCOLOUT</td><td>122.0</td><td>ACOLOUT</td><td>SCOLOUT</td><td>NCOLOUT</td><td>BCOLOUT</td></tr>
<tr><td>Condenser Coolant Out</td><td>°C</td><td>0.000</td><td>QCCOLOUT</td><td>40.0</td><td>ACCOLOU</td><td>SCCOLOUT</td><td>NCCOLOU</td><td>BCCOLOU</td></tr>
<tr><td>Left Air-to-Fuel Ratio</td><td>-</td><td>0.000</td><td>QLAFR</td><td>15.0</td><td>ALAFR</td><td>SLAFR</td><td>NLAFR</td><td>BLAFR</td></tr>
<tr><td>Right Air-to-Fuel Ratio</td><td>-</td><td>0.000</td><td>QRAFR</td><td>15.0</td><td>ARAFR</td><td>SRAFR</td><td>NRAFR</td><td>BRAFR</td></tr>
<tr><td>Left Exhaust Back Pressure</td><td>kPa</td><td>0.000</td><td>QLEXBP</td><td>6.0</td><td>ALEXBF</td><td>SLEXBP</td><td>NLEXBP</td><td>BLEXBP</td></tr>
<tr><td>Right Exhaust Back Pressure</td><td>kPa</td><td>0.000</td><td>QREXBP</td><td>6.0</td><td>AREXBF</td><td>SREXBP</td><td>NREXBP</td><td>BREXBP</td></tr>
<tr><td>Intake Air</td><td>kPa</td><td>0.000</td><td>QINAIR</td><td>0.05</td><td>AINAIR</td><td>SINAIR</td><td>NINAIR</td><td>BINAIR</td></tr>
<tr><td>Engine Coolant Flow</td><td>L/min</td><td>0.000</td><td>QCOLFLO</td><td>160.0</td><td>ACOLFLC</td><td>SCOLFLO</td><td>NCOLFLC</td><td>BCOLFLO</td></tr>
</table>

<table>
<tr><td rowspan="12">Non-controlled Parameters</td><td rowspan="2">Parameter</td><td rowspan="2">Units</td><td rowspan="2">Average</td><td rowspan="2">Standard Deviation</td><td colspan="2">Number of</td></tr>
<tr><td>Samples[A]</td><td>BQD[B]</td></tr>
<tr><td>Oil Sump</td><td>°C</td><td>AOSUMP</td><td>SOSUMP</td><td>NOSUMP</td><td>BOSUMP</td></tr>
<tr><td>Pump Outlet Pressure</td><td>kPa</td><td>APOUTP</td><td>SPOUTP</td><td>NPOUTP</td><td>BPOUTP</td></tr>
<tr><td>Gallery Pressure</td><td>kPa</td><td>AOILPR</td><td>SOILPRS</td><td>NOILPRS</td><td>BOILPRS</td></tr>
<tr><td>Engine Coolant In</td><td>°C</td><td>AECOLI</td><td>SECOLIN</td><td>NECOLIN</td><td>BECOLIN</td></tr>
<tr><td>Fuel Inlet</td><td>°C</td><td>AFUELIN</td><td>SFUELIN</td><td>NFUELIN</td><td>BFUELIN</td></tr>
<tr><td>Intake Air</td><td>°C</td><td>AINAT</td><td>SINAT</td><td>NINAT</td><td>BINAT</td></tr>
<tr><td>Intake Air Dew Point</td><td>°C</td><td>AINDEW</td><td>SINDEW</td><td>NINDEW</td><td>BINDEW</td></tr>
<tr><td>Intake Vacuum</td><td>kPa</td><td>AINVAC</td><td>SINVAC</td><td>NINVAC</td><td>BINVAC</td></tr>
<tr><td>Crankcase</td><td>kPa</td><td>ACCASEP</td><td>SCCASEP</td><td>NCCASEF</td><td>BCCASEP</td></tr>
<tr><td>Fuel Pressure</td><td>kPa</td><td>APFUEL</td><td>SPFUEL</td><td>NPFUEL</td><td>BPFUEL</td></tr>
</table>

		Oil Consumption Data					
HOURS	Initial Run-in	OCONH0	OCONH02	OCONH03	OCONH04	OCONH05	OCONH06
LEVEL (ml) low	OILLIN	OILLHC	OILLHC	OILLHC	OILLHC	OILLHC	OILLHC

NOx Measurement		
Hours	NOXHH007	NOXHH039
NO$_X$, ppm	NOX_H007	NOX_H039

Used Oil Analysis Results

Laboratory	LAB		Oilcode	OILCODE	
Test Stand No.		STAND	Test No.	STAND − STRUN − LABRUN	
Laboratory Oil Code		LABOCODE			
Formulation Stand Code	FORM				

Viscosity Increase Data (cSt @ 40°C)			
Hours	**Viscosity[A]**	**Change**	**Percent**
New Oil	VNEW		
Initial[B]	VINI		
VISTH0	VIS_H010	DVISH010	PVISH010
VISTH0	VIS_H020	DVISH020	PVISH020
VISTH0	VIS_H030	DVISH030	PVISH030
VISTH0	VIS_H040	DVISH040	PVISH040
VISTH0	VIS_H050	DVISH050	PVISH050
VISTH0	VIS_H060	DVISH060	PVISH060
TESTLE	VISEOT	DVISEOT	PVIS

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

Results of ICP Analysis of Used Oil								
Test Hours	Initial	TST_H0	TST_H02	TST_H03	TST_H04	TST_H05	TST_H06	TESTLE
Iron	FEWMIN	FEWMH0	FEWMH0	FEWMH0	FEWMH0	FEWMH0	FEWMH0	FEWMEO
Copper	CUWMI	CUWMH0	CUWMH0	CUWMH0	CUWMH0	CUWMH0	CUWMH0	CUWMEO
Lead	PBWMIN	PBWMH0	PBWMH0	PBWMH0	PBWMH0	PBWMH0	PBWMH0	PBWMEO

Sequence IIIFHD
Form 7

Blowby Values & Plot

Laboratory	LAB	Oilcode	OILCODE			
Test Stand No.	STAND	Test No.	STAND	– STRUN –	LABRUN	
Laboratory Oil Code		LABOCODE				
Formulation Stand Code	FORM					

Blowby Plot

BLOWBYIM

Test Hours	BBYTH(	BBYTH	BBYTH	BBYTH	BBYTH	BBYTH	BBYTH(	BBYTH	BBYTH	BBYTH
Blowby, L/min	BLWBH	BLWBH	BLWBH	BLWBH	BLWBH	BLWBH	BLWBH	BLWBH	BLWBH	BLWBH
Test Hours	BBYTH	BBYTH								**Average**
Blowby, L/min	BLWBH	BLWBH								ABLOB

Viscosity Increase Plot

Laboratory	LAB	Oilcode	OILCODE			
Test Stand No.		STAND	Test No.	STAND – STRUN – LABRUN		
Laboratory Oil Code		LABOCODE				
Formulation Stand Code		FORM				

VISINIM

Hardware Information

Laboratory	LAB	Oilcode	OILCODE		
Test Stand No.	STAND		Test No.	STAND – STRUN – LABRUN	
Laboratory Oil Code	LABOCODE				
Formulation Stand Code	FORM				

Build Completion Date	BUILDDT	Piston Batch (Code)	PISTBAT
Block Serial Number	BLOCKSN	Piston Size (Grade)	PISTSIZE
Crankshaft Serial Number	CRANKSN	Piston Ring Batch Code	RINGCODE
Camshaft Serial Number	CAMSN	Oil Filter Batch Code	OILFIBAT
Cylinder Head Serial Number, Left	LHEADSN	Intake Valve Seals Batch Code	INVSLBAT
Cylinder Head Serial Number, Right	RHEADSN	Valve Springs Batch Code	VALSPBAT
Bearing Kit Serial Number	BRNGSN		
Top Ring Gap, mils	TRINGGAP		
Bottom Ring Gap, mils	BRINGGAP		

Downtime & Outlier Report Form

Lab	LAB	Oil Code	OILCODE			
Stand	STAND	Test No.	STAND	--	STRUN	-- LABRUN
Laboratory Oil Code		LABOCODE				
Formulation Stand Code		FORM				

Number of Downtime Occurrences		DWNOCR	

Test Hours	Date	Downtime	Reasons
DOWNR001	DDATR001	DTIMR001	DREAR001
DOWNR002	DDATR002	DTIMR002	DREAR002
DOWNR003	DDATR003	DTIMR003	DREAR003
DOWNR004	DDATR004	DTIMR004	DREAR004
DOWNR005	DDATR005	DTIMR005	DREAR005
DOWNR006	DDATR006	DTIMR006	DREAR006
DOWNR007	DDATR007	DTIMR007	DREAR007
DOWNR008	DDATR008	DTIMR008	DREAR008
DOWNR009	DDATR009	DTIMR009	DREAR009
DOWNR010	DDATR010	DTIMR010	DREAR010
DOWNR011	DDATR011	DTIMR011	DREAR011
DOWNR012	DDATR012	DTIMR012	DREAR012
DOWNR013	DDATR013	DTIMR013	DREAR013
DOWNR014	DDATR014	DTIMR014	DREAR014
DOWNR015	DDATR015	DTIMR015	DREAR015
		TOTLDOWN	**Total Downtime (hours) – Maximum allowable downtime: 24 hours**

Other Comments	
Number of Comment Lines	TOTCOM
OCOMR001	
OCOMR002	
OCOMR003	
OCOMR004	
OCOMR005	
OCOMR006	
OCOMR007	
OCOMR008	
OCOMR009	
OCOMR010	
OCOMR011	
OCOMR012	
OCOMR013	
OCOMR014	
OCOMR015	

Sequence IIIFHD
Form 10A

Downtime & Outlier Report Form

Lab	LAB	Oil Code	OILCODE			
Stand	STAND	Test No.	STAND --	STRUN	--	LABRUN
Laboratory Oil Code		LABOCODE				
Formulation Stand Code		FORM				

Number of Downtime Occurrences	DWNOCR		
Test Hours	**Date**	**Downtime**	**Reasons**
DOWNR01	DDATR016	DTIMR016	DREAR016
DOWNR017	DDATR017	DTIMR017	DREAR017
DOWNR018	DDATR018	DTIMR018	DREAR018
DOWNR019	DDATR019	DTIMR019	DREAR019
DOWNR020	DDATR020	DTIMR020	DREAR020
DOWNR021	DDATR021	DTIMR021	DREAR021
DOWNR022	DDATR022	DTIMR022	DREAR022
DOWNR023	DDATR023	DTIMR023	DREAR023
DOWNR024	DDATR024	DTIMR024	DREAR024
DOWNR025	DDATR025	DTIMR025	DREAR025
DOWNR026	DDATR026	DTIMR026	DREAR026
DOWNR027	DDATR027	DTIMR027	DREAR027
DOWNR028	DDATR028	DTIMR028	DREAR028
DOWNR029	DDATR029	DTIMR029	DREAR029
DOWNR030	DDATR030	DTIMR030	DREAR030
		TOTLDOWN	**Total Downtime (hours) – Maximum allowable downtime: 24 hours**

Other Comments	
Number of Comment Lines	TOTCOM

OCOMR016
OCOMR017
OCOMR018
OCOMR019
OCOMR020
OCOMR021
OCOMR022
OCOMR023
OCOMR024
OCOMR025
OCOMR026
OCOMR027
OCOMR028
OCOMR029
OCOMR030

Sequence IIIFHD
Form 10B

Downtime & Outlier Report Form

Lab	LAB	Oil Code	OILCODE			
Stand	STAND	Test No.	STAND	-- STRUN	-- LABRUN	
Laboratory Oil Code			LABOCODE			
Formulation Stand Code			FORM			

Number of Downtime Occurrences		DWNOCR	
Test Hours	Date	Downtime	Reasons
DOWNR031	DDATR031	DTIMR031	DREAR031
DOWNR032	DDATR032	DTIMR032	DREAR032
DOWNR033	DDATR033	DTIMR033	DREAR033
DOWNR034	DDATR034	DTIMR034	DREAR034
DOWNR035	DDATR035	DTIMR035	DREAR035
DOWNR036	DDATR036	DTIMR036	DREAR036
DOWNR037	DDATR037	DTIMR037	DREAR037
DOWNR038	DDATR038	DTIMR038	DREAR038
DOWNR039	DDATR039	DTIMR039	DREAR039
DOWNR040	DDATR040	DTIMR040	DREAR040
DOWNR041	DDATR041	DTIMR041	DREAR041
DOWNR042	DDATR042	DTIMR042	DREAR042
DOWNR043	DDATR043	DTIMR043	DREAR043
DOWNR044	DDATR044	DTIMR044	DREAR044
DOWNR045	DDATR045	DTIMR045	DREAR045
		TOTLDOWN	**Total Downtime (hours) – Maximum allowable downtime: 24 hours**

Other Comments	
Number of Comment Lines	TOTCOM
OCOMR031	
OCOMR032	
OCOMR033	
OCOMR034	
OCOMR035	
OCOMR036	
OCOMR037	
OCOMR038	
OCOMR039	
OCOMR040	
OCOMR041	
OCOMR042	
OCOMR043	
OCOMR044	
OCOMR045	

Test Laboratory	SUBLAB			
Test Sponsor	TSTSPON1			
Formulation / Stand Code	FORM			
Test Number	TESTNUM			
Start Date	DTSTRT	Start Time	STRTTIME	Time Zone	TZONE

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 ESRQME   No ORQME*

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 YESFULL   No NOFULL*

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 ESNODE*   No NONODEC

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 YESDEV*   No NODEV *(This currently applies only to specific deviations identified in the ASTM Information Letter System)*

Check The Appropriate Conclusion

INCLUDE	Operational review of this test indicates that the results should be included in the Multiple Test Acceptance Criteria calculations.
DONOTINC	*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
ACCCOMM1
ACCCOMM2
ACCCOMM3
ACCCOMM4

SUBSIGIM

Signature

SUBDATE

Date

SUBNAME

Typed Name

SUBTITLE

Title