

**Caterpillar C-13  
Engine Oil Test**

**Version**

**Title / Validity Declaration Page  
Form 1**

**Conducted For**

	V =	Valid; The Reference Oil / Non-Reference Oil was evaluated in accordance with the test procedure.
	I =	Invalid; The Reference / Non-Reference Oil was not evaluated in accordance with the test procedure.
	N =	Results cannot be interpreted as representative of oil performance (Non-Reference Oil) and shall not be used in determining average test results using Multiple Test Criteria.

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

Test Number		
<b>Stand:</b>	<b>Stand Run No.:</b>	
<b>End of Test Date:</b>	<b>End of Test Time:</b>	
<b>Oil Code / CMIR:</b> <sup>A</sup>		
<b>Formulation / Stand Code:</b> <sup>B</sup>		
<b>Altcode 1:</b>	<b>Altcode 2:</b>	<b>Altcode 3:</b>

In my opinion the test \_\_\_\_\_ been conducted in a valid manner in accordance with Test Method D XXXX and the appropriate amendments through the information letter system. The remarks included in this report describe the anomalies associated with this test.

<sup>A</sup> CMIR or Non-Reference Oil Code <sup>B</sup> ACC-Registered Tests Only

Submitted By: \_\_\_\_\_

Testing Laboratory

Signature

Typed Name

Title

**Caterpillar C-13  
Engine Oil Test**

**Form 2  
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**Caterpillar C-13  
Engine Oil Test**

**Form 3  
Summary of Test Method**

The CAT C-13 Engine Oil Test is an engine-dynamometer test which evaluates the ability of an engine oil to protect against ring sticking and oil consumption.

The test engine is a CAT C-13 diesel engine with ACERT technology. It is an in-line six cylinder, four stroke, turbocharged engine with electronically controlled fuel injection.

<b>C-13 Test Conditions</b>	
<b>Parameter</b>	<b>Value</b>
Time, h	500
Speed, r/min	1800
Fuel Flow, g/min	1200
Inlet Manifold Temperature, °C	40
Coolant Out Temperature, °C	88
Fuel In Temperature, °C	40
Oil Gallery Temperature, °C	98
Intake Air Temperature, ° C	25
Tailpipe Exhaust Temperature, °C	Record
Intake Air Restriction, kPa Absolute	93
Intake Manifold Pressure, kPa	280
Exhaust Back Pressure, kPa	6
Dew Point, °C	Record
Coolant System Pressure, kPa	99 - 107
Power, Kw	Record
Torque, Nm	Record
Oil Gallery Pressure, kPa	Record

**Caterpillar C-13  
Engine Oil Test  
Test Results Summary  
Form 4**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		
<b>Oil Code:</b>		
<b>Formulation / Stand Code:</b>		

Date Test Started				
Start Time				
Test Length				
Laboratory Oil Code				
TMC Oil Code <sup>A</sup>				
SAE Viscosity				
Engine Number				
Engine Hours				
Engine Serial No.				
Hot Ring Sticking? <Yes or No>				
Piston, Ring, or Liner Scuffing? <Yes or No>				
Oil Consumption 100 – 150 Hours, g/h				
Oil Consumption 450 – 500 Hours, g/h				
	<b>TGC (demerits)</b>	<b>TLC (demerits)</b>	<b>2<sup>nd</sup> Ring Top Carbon (demerits)</b>	<b>Oil Consumption Delta (g/h)</b>
Original Result				
Transformed Result <sup>B</sup>				
Correction Factor <sup>B</sup>				
Corrected Transformed Result <sup>B</sup>				
Final Transformed Result <sup>B</sup>				
<b>Final Result</b>				
<b>Merits</b>				
<b>Total Merits</b>				

Last Stand Reference Results				
Test Number:				
Oil Code:				
Test Length				
TMC Oil Code				
EOT Date				
EOT Time				
Stand Calibration Expiration Date				
Oil Consumption 100 – 150 Hours, g/h				
Oil Consumption 450 – 500 Hours, g/h				
	<b>TGC (demerits)</b>	<b>TLC (demerits)</b>	<b>2<sup>nd</sup> Ring Top Carbon (demerits)</b>	<b>Oil Consumption Delta (g/h)</b>
<b>Final Result</b>				

<sup>A</sup> Reference Tests Only

<sup>B</sup> 2<sup>nd</sup> Ring Top Carbon and Oil Consumption Delta Values in Transformed Units

**Caterpillar C-13  
Engine Oil Test  
Operational Summary  
Form 5**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		
<b>Oil Code:</b>		
<b>Formulation / Stand Code:</b>		

<b>Controlled Parameters</b>								
<b>Parameter</b>	<b>Units</b>	<b>QI Threshold</b>	<b>EOT QI</b>	<b>Target</b>	<b>Average</b>	<b>Samples</b>	<b>BQD</b>	<b>Over/Under Range</b>
<b>Speed</b>	r/min	0.000		1800				
<b>Fuel Flow</b>	g/min	0.000		1200				
<b>Inlet Air Temp.</b>	°C	0.000		25				
<b>Intake Manifold Temp.</b>	°C	0.000		40				
<b>Fuel In Temp.</b>	°C	0.000		40				
<b>Coolant Out Temp.</b>	°C	0.000		88				
<b>Oil Gallery Temp.</b>	°C	0.000		98				
<b>Exhaust Back Press.</b>	kPa	0.000		6				

<b>Non-QI Control Parameters</b>						
<b>Parameter</b>	<b>Units</b>	<b>Specification</b>	<b>Average</b>	<b>Samples</b>	<b>BQD</b>	<b>Over/Under Range</b>
<b>Inlet Air Pressure</b>	kPa	93.0 ± 1.5				

<b>Ranged Parameter</b>						
<b>Parameter</b>	<b>Units</b>	<b>Specification</b>	<b>Average</b>	<b>Samples</b>	<b>BQD</b>	<b>Over/Under Range</b>
<b>Inlet Manifold Press.</b>	kPa	275 – 285				

<b>Non-Controlled Paramters</b>						
<b>Parameter</b>	<b>Units</b>	<b>Typical Values</b>	<b>Average</b>			
<b>Engine Torque</b>	Nm	Tbd				
<b>Oil Sump Temp.</b>	°C	Tbd				
<b>Oil Gallery Press.</b>	kPa	Tbd				
<b>Dew Point</b>	°C	Tbd				











**Caterpillar C-13  
Engine Oil Test  
Test Fuel Analysis (Last Batch)  
Form 8**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		
<b>Oil Code:</b>		
<b>Formulation / Stand Code:</b>		
<b>Fuel Supplier:</b>		<b>Fuel Batch ID:</b>

Measurement	Specs.	Analysis		Test Method
		New	EOT	
<b>Total Sulfur, ppm</b>	<b>7 – 15</b>			<b>D 5453</b>
<b>Gravity, °API</b>	<b>34 – 37</b>			<b>D 4052</b>
<b>Hydrocarbon Composition</b>				
<b>Aromatics, % Weight</b>	<b>26 – 31.5</b>			<b>D 5186</b>
<b>Olefins, % Volume</b>	<b>Report</b>			<b>D 1319</b>
<b>Cetane Index</b>	<b>Report</b>			<b>D 976</b>
<b>Cetane No.</b>	<b>43 – 47</b>			<b>D 613</b>
<b>Copper Strip Corrosion</b>	<b>1 Maximum</b>			<b>D 130</b>
<b>Flash Point, °C</b>	<b>54 Minimum</b>			<b>D 93</b>
<b>Pour Point, °C</b>	<b>-18 Maximum</b>			<b>D 97</b>
<b>Carbon Residue on 10% Residuum, %</b>	<b>0.35 Maximum</b>			<b>D 524 (10% Bottoms)</b>
<b>Water &amp; Sediment, % Volume</b>	<b>0.05 Maximum</b>			<b>D 2709</b>
<b>Viscosity, cSt @ 40°C</b>	<b>2.0 – 2.6</b>			<b>D 445</b>
<b>Total Acid Number</b>	<b>0.05 Maximum</b>			<b>D 664</b>
<b>Strong Acid Number</b>	<b>0.00 Maximum</b>			<b>D 664</b>
<b>Accelerated Stability</b>	<b>1.5 max</b>			<b>D 2274</b>
<b>Ash, % Weight</b>	<b>0.005 Maximum</b>			<b>D 482</b>
<b>SLBOCLE, g</b>	<b>3100 min<sup>A</sup></b>			<b>D 6078<sup>A</sup></b>
<b>90% Distillation, °C</b>	<b>282 – 338</b>			<b>D 86</b>

<sup>A</sup> May be altered to be consistent with CARB or ASTM diesel fuel specifications.

**Caterpillar C-13  
Engine Oil Test  
Build-Up and Hardware Information  
Form 9**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		
<b>Oil Code:</b>		
<b>Formulation / Stand Code:</b>		

<b>Hardware</b>	
<b>Part</b>	<b>Part Number</b>
Intake Valve	
Exhaust Valve	
Cylinder Head	
Head Gasket	
Pistons	
Injectors	
Rod Bearings	
Liners	
Top Ring	
2 <sup>nd</sup> Ring	
Oil Ring	

**Caterpillar C-13  
Engine Oil Test  
Piston Deposit Rating Summary  
Form 10**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		
<b>Oil Code:</b>		
<b>Formulation / Stand Code:</b>		

Parameter								
Piston No.	TGC Demerits	TLC Demerits	R2TC Demerits	TLHC %	AGF %	WD Demerits	IGC Demerits	2LC Demerits
1								
2								
3								
4								
5								
6								
<b>Average</b>								
<b>Std. Dev.</b>								
<b>Outlier</b>								
<b>Outlier Screened Results</b>								
<b>Average</b>								

Piston No.		Top	Int.	Oil	Crown	Skirt	Liner
1	Stuck Ring						
	Scuffed						
2	Stuck Ring						
	Scuffed						
3	Stuck Ring						
	Scuffed						
4	Stuck Ring						
	Scuffed						
5	Stuck Ring						
	Scuffed						
6	Stuck Ring						
	Scuffed						

**Caterpillar C-13  
Engine Oil Test  
Rating Summary: Piston No. 1  
Form 11**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		<b>Oil Code:</b>
<b>Formulation / Stand Code:</b>		
<b>Date Rated:</b>	<b>Rater Initials:</b>	<b>Verified By:</b>

Total Piston Ratings Summary																					
	Deposit Factor	Grooves				Lands				Deposit Factor	Groove		Lands				Oil Cooling Gallery		Under Crown		
		No. 1		No. 2		No. 1		No. 2			No. 3		No. 3		No. 4		A,%	DEM.	A,%	DEM.	
		A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.		A,%	DEM.	A,%	DEM.	A,%	DEM.					
C A R B O N	HC - 1.0																				
	MC - 0.5																				
	LC - .25																				
	Total																				
V A R I A T I O N	8 - 9																				
	7 - 7.9																				
	6 - 6.9										7.5										
	5 - 5.9																				
	4 - 4.9										4.5										
	3 - 3.9																				
	2 - 2.9																				
	1 - 1.9										1.5										
	>0 - 0.9																				
	Clean	0		0		0		0			0		0		0				0		
Total																					
Rating																					
Location Factor	2		3		1		3			20		20		60				1			
Ind. Rating																					
<b>WDP</b>				<b>TGC</b>				<b>TLC</b>				<b>Unweighted Deposits</b>				<b>Top Land Flaked Carbon %</b>					
<b>TGF</b>				<b>IGF %</b>				<b>TLHC %</b>				<b>Acc. Groove Fill %</b>									

**Caterpillar C-13  
Engine Oil Test  
Rating Summary: Piston No. 2  
Form 12**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		<b>Oil Code:</b>
<b>Formulation / Stand Code:</b>		
<b>Date Rated:</b>	<b>Rater Initials:</b>	<b>Verified By:</b>

**Total Piston Ratings Summary**

	Deposit Factor	Grooves				Lands				Deposit Factor	Groove		Lands				Oil Cooling Gallery		Under Crown		
		No. 1		No. 2		No. 1		No. 2			No. 3		No. 3		No. 4		A,%	DEM.	A,%	DEM.	
		A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.		A,%	DEM.	A,%	DEM.	A,%	DEM.					
C A R B O N	HC - 1.0																				
	MC - 0.5																				
	LC - .25																				
	Total																				
V A R I A T I O N	8 - 9									7.5											
	7 - 7.9																				
	6 - 6.9																				
	5 - 5.9									4.5											
	4 - 4.9																				
	3 - 3.9																				
	2 - 2.9									1.5											
	1 - 1.9																				
	>0 - 0.9																				
	Clean		0		0		0		0			0		0		0				0	
Total																					
Rating																					
Location Factor		2		3		1		3			20		20		60				1		
Ind. Rating																					
<b>WDP</b>		<b>TGC</b>				<b>TLC</b>				<b>Unweighted Deposits</b>				<b>Top Land Flaked Carbon %</b>							
<b>TGF</b>		<b>IGF %</b>				<b>TLHC %</b>				<b>Acc. Groove Fill %</b>											

**Caterpillar C-13  
Engine Oil Test  
Rating Summary: Piston No. 3  
Form 13**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		<b>Oil Code:</b>
<b>Formulation / Stand Code:</b>		
<b>Date Rated:</b>	<b>Rater Initials:</b>	<b>Verified By:</b>

Total Piston Ratings Summary																				
	Deposit Factor	Grooves				Lands				Deposit Factor	Groove		Lands				Oil Cooling Gallery		Under Crown	
		No. 1		No. 2		No. 1		No. 2			No. 3		No. 3		No. 4		A,%	DEM.	A,%	DEM.
		A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.		A,%	DEM.	A,%	DEM.	A,%	DEM.				
C A R B O N	HC - 1.0																			
	MC - 0.5																			
	LC - .25																			
	Total																			
V A R I A T I O N	8 - 9																			
	7 - 7.9									7.5										
	6 - 6.9																			
	5 - 5.9																			
	4 - 4.9									4.5										
	3 - 3.9																			
	2 - 2.9																			
	1 - 1.9									1.5										
	>0 - 0.9																			
	Clean		0		0		0		0			0		0		0			0	
Total																				
Rating																				
Location Factor		2		3		1		3			20		20		60			1		
Ind. Rating																				
<b>WDP</b>				<b>TGC</b>				<b>TLC</b>				<b>Unweighted Deposits</b>				<b>Top Land Flaked Carbon %</b>				
<b>TGF</b>				<b>IGF %</b>				<b>TLHC %</b>				<b>Acc. Groove Fill %</b>								

**Caterpillar C-13  
Engine Oil Test  
Rating Summary: Piston No. 4  
Form 14**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		<b>Oil Code:</b>
<b>Formulation / Stand Code:</b>		
<b>Date Rated:</b>	<b>Rater Initials:</b>	<b>Verified By:</b>

Total Piston Ratings Summary																				
	Deposit Factor	Grooves				Lands				Deposit Factor	Groove		Lands				Oil Cooling Gallery		Under Crown	
		No. 1		No. 2		No. 1		No. 2			No. 3		No. 3		No. 4					
		A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.		A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.
C A R B O N	HC - 1.0																			
	MC - 0.5																			
	LC - .25																			
	Total																			
V A R I A T I O N	8 - 9																			
	7 - 7.9									7.5										
	6 - 6.9																			
	5 - 5.9																			
	4 - 4.9									4.5										
	3 - 3.9																			
	2 - 2.9																			
	1 - 1.9									1.5										
	>0 - 0.9																			
	Clean		0		0		0		0			0		0		0			0	
Total																				
Rating																				
Location Factor		2		3		1		3			20		20		60			1		
Ind. Rating																				
<b>WDP</b>				<b>TGC</b>				<b>TLC</b>				<b>Unweighted Deposits</b>				<b>Top Land Flaked Carbon %</b>				
<b>TGF</b>				<b>IGF %</b>				<b>TLHC %</b>				<b>Acc. Groove Fill %</b>								



**Caterpillar C-13  
Engine Oil Test  
Rating Summary: Piston No. 5  
Form 15**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		<b>Oil Code:</b>
<b>Formulation / Stand Code:</b>		
<b>Date Rated:</b>	<b>Rater Initials:</b>	<b>Verified By:</b>

**Total Piston Ratings Summary**

	Deposit Factor	Grooves				Lands				Deposit Factor	Groove		Lands				Oil Cooling Gallery		Under Crown	
		No. 1		No. 2		No. 1		No. 2			No. 3		No. 3		No. 4		A,%	DEM.	A,%	DEM.
		A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.		A,%	DEM.	A,%	DEM.	A,%	DEM.				
C A R B O N	HC - 1.0																			
	MC - 0.5																			
	LC - .25																			
	Total																			
V A R I A T I O N	8 - 9																			
	7 - 7.9									7.5										
	6 - 6.9																			
	5 - 5.9																			
	4 - 4.9									4.5										
	3 - 3.9																			
	2 - 2.9																			
	1 - 1.9									1.5										
	>0 - 0.9																			
	Clean		0		0		0		0			0		0		0				0
Total																				
Rating																				
Location Factor		2		3		1		3			20		20		60				1	
Ind. Rating																				
<b>WDP</b>		<b>TGC</b>				<b>TLC</b>				<b>Unweighted Deposits</b>				<b>Top Land Flaked Carbon %</b>						
<b>TGF</b>		<b>IGF %</b>				<b>TLHC %</b>				<b>Acc. Groove Fill %</b>										

**Caterpillar C-13  
Engine Oil Test  
Rating Summary: Piston No. 6  
Form 16**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		<b>Oil Code:</b>
<b>Formulation / Stand Code:</b>		
<b>Date Rated:</b>	<b>Rater Initials:</b>	<b>Verified By:</b>

<b>Total Piston Ratings Summary</b>																				
	Deposit Factor	Grooves				Lands				Deposit Factor	Groove		Lands				Oil Cooling Gallery		Under Crown	
		No. 1		No. 2		No. 1		No. 2			No. 3		No. 3		No. 4		A,%	DEM.	A,%	DEM.
		A,%	DEM.	A,%	DEM.	A,%	DEM.	A,%	DEM.		A,%	DEM.	A,%	DEM.	A,%	DEM.				
C A R B O N	HC - 1.0																			
	MC - 0.5																			
	LC - .25																			
	Total																			
	8 - 9																			
V A R I A T I O N	7 - 7.9									7.5										
	6 - 6.9																			
	5 - 5.9																			
	4 - 4.9										4.5									
	3 - 3.9																			
	2 - 2.9																			
	1 - 1.9											1.5								
	>0 - 0.9																			
	Clean		0		0		0		0			0		0		0			0	
Total																				
Rating																				
Location Factor		2		3		1		3			20		20		60			1		
Ind. Rating																				
<b>WDP</b>				<b>TGC</b>				<b>TLC</b>				<b>Unweighted Deposits</b>				<b>Top Land Flaked Carbon %</b>				
<b>TGF</b>				<b>IGF %</b>				<b>TLHC %</b>				<b>Acc. Groove Fill %</b>								









**Caterpillar C-13  
Engine Oil Test  
Rating Summary: Piston No. 5  
Form 21**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		
<b>Oil Code:</b>		
<b>Formulation / Stand Code:</b>		

Carbon				Varnish											
Deposit		HC	MC	LC	9.0-8	7.9-7	6.9-6	5.9-5	4.9-4	3.9-3	2.9-2	1.9-1	0.9-0	Clean	
Groove Top And Bottom % Area	1	T													
		B													
	2	T													
		B													
	3	T													
		B													
Top Bottom And Back Of Rings % Area	1	T													
		B													
		BK													
	2	T													
		B													
		BK													
	3	T													
		B													
		BK													
Top Ring Stuck						%									
Top Ring Scuffed						%									
Second Ring Stuck						%									
Second Ring Scuffed						%									
Oil Ring Stuck						%									
Oil Ring Scuffed						%									
Crown Scuffed						%									
Skirt Scuffed						%									
Liner Scuffed						%									





**Caterpillar C-13  
Engine Oil Test  
Oil Consumption Plot  
Form 23**

<b>Laboratory:</b>	<b>EOT Date:</b>	<b>EOT Time:</b>
<b>Test Number:</b>		
<b>Oil Code:</b>		
<b>Formulation / Stand Code:</b>		

<b>Test Hours</b>	<b>50</b>	<b>100</b>	<b>150</b>	<b>200</b>	<b>250</b>	<b>300</b>	<b>350</b>	<b>400</b>	<b>450</b>	<b>500</b>
<b>Oil Consumption, g/h</b>										
<b>R<sup>2</sup></b>										

**100 – 150 h  
Oil  
Consumption:**

**450 – 500 h  
Oil  
Consumption:**

**Delta OC:**



Test Hours

**Caterpillar C-13  
Engine Oil Test  
Form 24  
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.*

<b>Comments</b>

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Typed Name

\_\_\_\_\_  
Title