

**Caterpillar C-13
Engine Oil Test**

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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 loss of 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.

C-13 Test Conditions	
Parameter	Value
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	Record
Intake Air Temperature, ° C	25
Tailpipe Exhaust Temperature, °C	Record
Intake Air Restriction, kPa Absolute	95
Intake Manifold Pressure, kPa	280
Exhaust Back Pressure, kPa	6
Crankcase Pressure, kPa	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**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		

Start Date: YYYYMMDD	Start Time: HH:MM	Test Length: S1234
Laboratory Oil Code: CCCCCCCCCCCCCCCCCCCCCC	TMC Oil Code^A: CCCCCC	
Engine Number: CCCCCC	Engine Hours: CCCCC	Engine Serial No.: CCCCCCCC

Oil Consumption, g/hr		
100 – 150	450 – 500	% Inc.
S12.12	S12.12	S123.1

Piston No.	WD	TGC	TLC	TGF	IGF	IGC	AGF	Loss of Ring Side Clearance		
								Top	Int.	Oil
1	S1234.1	S12.12	S12.12	S12	S123	S12.12	S123	AAAAAAA	AAAAAAA	AAAAAAA
2	S1234.1	S12.12	S12.12	S12	S123	S12.12	S123	AAAAAAA	AAAAAAA	AAAAAAA
3	S1234.1	S12.12	S12.12	S12	S123	S12.12	S123	AAAAAAA	AAAAAAA	AAAAAAA
4	S1234.1	S12.12	S12.12	S12	S123	S12.12	S123	AAAAAAA	AAAAAAA	AAAAAAA
5	S1234.1	S12.12	S12.12	S12	S123	S12.12	S123	AAAAAAA	AAAAAAA	AAAAAAA
6	S1234.1	S12.12	S12.12	S12	S123	S12.12	S123	AAAAAAA	AAAAAAA	AAAAAAA
Average	S1234.1	S12.12	S12.12	S12	S123	S12.12	S123	AAAAAAA	AAAAAAA	AAAAAAA

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

^A Reference Oil Tests Only

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

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		

Controlled Parameters

Parameter	Units	Target	Tolerance	Average	Samples
Engine Speed	r/min	1800	± 5	S12345	S1234
Fuel Flow	g/min	1200	± 6	S12.12	S1234
Temperature					
Inlet Air	°C	25	± 2	S1234	S1234
Intake Manifold Air	°C	40	± 2	S1234	S1234
Fuel Inlet	°C	40	± 1	S1234	S1234
Coolant Outlet	°C	88	± 2	S1234	S1234
Pressure					
Inlet Air	kPa	95	± 3	S12.12	S1234
Exhaust Stack	kPa	6	± 1	S1.1	S1234
CCV Outlet	kPa	6.8	± 1	S1.12	S1234
Intake Manifold	kPa	280	± 5	S123	S1234

Non-Controlled Parameters

Parameter	Units	Target	Tolerance	Average	Samples
Engine Torque	Nm	1800	Record	S1234	S1234
Temperature					
Oil Gallery	°C	TBD	Record	S1234	S1234

**Caterpillar C-13
Engine Oil Test
Rod Bearing Weight Loss
Form 6**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCC-C-C-CCCC-CC-CC-CCCC		

Cylinder No.	Location	SOT Weight, g	EOT Weight, g	Weight Change, mg
1	Upper	S12.1234	S12.1234	S123.1
2	Upper	S12.1234	S12.1234	S123.1
3	Upper	S12.1234	S12.1234	S123.1
4	Upper	S12.1234	S12.1234	S123.1
5	Upper	S12.1234	S12.1234	S123.1
6	Upper	S12.1234	S12.1234	S123.1
Upper Bearing Average Weight Loss, mg				S123.1
Upper Bearing Minimum Weight Loss, mg				S123.1
Upper Bearing Maximum Weight Loss, mg				S123.1

Cylinder No.	Location	SOT Weight, g	EOT Weight, g	Weight Change, mg
1	Lower	S12.1234	S12.1234	S123.1
2	Lower	S12.1234	S12.1234	S123.1
3	Lower	S12.1234	S12.1234	S123.1
4	Lower	S12.1234	S12.1234	S123.1
5	Lower	S12.1234	S12.1234	S123.1
6	Lower	S12.1234	S12.1234	S123.1
Lower Bearing Average Weight Loss, mg				S123.1
Lower Bearing Minimum Weight Loss, mg				S123.1
Lower Bearing Maximum Weight Loss, mg				S123.1

**Caterpillar C-13
Engine Oil Test
Ring Weight Loss
Form 7**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		

Cylinder No.	Top Ring SOT Weight, g	Top Ring EOT Weight, g	Weight Loss, mg
1	S12.1234	S12.1234	S123.1
2	S12.1234	S12.1234	S123.1
3	S12.1234	S12.1234	S123.1
4	S12.1234	S12.1234	S123.1
5	S12.1234	S12.1234	S123.1
6	S12.1234	S12.1234	S123.1
	Top Ring Average Weight Loss, mg		S123
	Top Ring Weight Loss Std. Dev., mg		S123.1
	Top Ring Min. Weight Loss, mg		S123.1
	Top Ring Max. Weight Loss, mg		S123.1

Cylinder No.	2 nd Ring SOT Weight, g	2 nd Ring EOT Weight, g	Weight Loss, mg
1	S12.1234	S12.1234	S123.1
2	S12.1234	S12.1234	S123.1
3	S12.1234	S12.1234	S123.1
4	S12.1234	S12.1234	S123.1
5	S12.1234	S12.1234	S123.1
6	S12.1234	S12.1234	S123.1
	2 nd Ring Average Weight Loss, mg		S123.1
	2 nd Ring Weight Loss Std. Dev., mg		S123.1
	2 nd Ring Min. Weight Loss, mg		S123.1
	2 nd Ring Max. Weight Loss, mg		S123.1

Cylinder No.	Oil Ring SOT Weight, g	Oil Ring EOT Weight, g	Weight Loss, mg
1	S12.1234	S12.1234	S123.1
2	S12.1234	S12.1234	S123.1
3	S12.1234	S12.1234	S123.1
4	S12.1234	S12.1234	S123.1
5	S12.1234	S12.1234	S123.1
6	S12.1234	S12.1234	S123.1
	Oil Ring Average Weight Loss, mg		S123.1
	Oil Ring Weight Loss Std. Dev., mg		S123.1
	Oil Ring Min. Weight Loss, mg		S123.1
	Oil Ring Max. Weight Loss, mg		S123.1

**Caterpillar C-13
Engine Oil Test
Liner Wear Summary
Form 10**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		

Position	Wear Step (µm)						
	Cylinder Number						
	1	2	3	4	5	6	Average
3:00 (Thrust)	S123.1	S123.1	S123.1	S123.1	S123.1	S123.1	S123.1
6:00 (Rear)	S123.1	S123.1	S123.1	S123.1	S123.1	S123.1	S123.1
9:00 (Anti-Thrust)	S123.1	S123.1	S123.1	S123.1	S123.1	S123.1	S123.1
12:00 (Front)	S123.1	S123.1	S123.1	S123.1	S123.1	S123.1	S123.1
Average	S123.1	S123.1	S123.1	S123.1	S123.1	S123.1	S123.1

Summary	As Measured
Average, µm	S123.1
Minimum, µm	S123.1
Maximum, µm	S123.1

**Caterpillar C-13
Engine Oil Test
Test Fuel Analysis (Last Batch)
Form 12**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		

Measurement	Specs.	Analysis		Test Method
		New	EOT	
Total Sulfur, ppm	7 - 15	S1.12	S1.12	D 5453
Gravity, °API	34 - 37	S1.1	S1.1	D 4052
Hydrocarbon Composition				
Aromatics, % Weight	26 – 31.5	S1.1		D 5186
Olefins, % Volume	Report	S12.1		D 1319
Cetane Index	Report	S1.1		D 976
Cetane No.	43 – 47	S1.1		D 613
Copper Strip Corrosion	1 Maximum	AAAA		D 130
Flash Point, °C	54 Minimum	S123		D 93
Pour Point, °C	-18 Maximum	S123		D 97
Carbon Residue on 10% Residuum, %	0.35 Maximum	S12.12		D 524 (10% Bottoms)
Water & Sediment, % Volume	0.05 Maximum	AAAAAA		D 2709
Viscosity, cSt @ 40°C	2.0 – 2.6	S12.1		D 445
Total Acid Number	0.05 Maximum	S1.1		D 664
Strong Acid Number	0.00 Maximum	S1.1		D 664
Accelerated Stability	1.5 max	S12.1		D 2274
Ash, % Weight	0.005 Maximum	S123.123		D 482
SLBOCLE, g	3100 min^A	S1234567		D 6078^A
90% Distillation, °C	282 – 338	S1234		D 86

^A 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 13**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		

Hardware	
Part	Part Number
Intake Valve	CCCCCCCCCCCCCCCCCCCC
Exhaust Valve	CCCCCCCCCCCCCCCCCCCC
Cylinder Head	CCCCCCCCCCCCCCCCCCCC
Head Gasket	CCCCCCCCCCCCCCCCCCCC
Pistons	CCCCCCCCCCCCCCCCCCCC
Injectors	CCCCCCCCCCCCCCCCCCCC
Rod Bearings	CCCCCCCCCCCCCCCCCCCC
Liners	CCCCCCCCCCCCCCCCCCCC
Top Ring	CCCCCCCCCCCCCCCCCCCC
2 nd Ring	CCCCCCCCCCCCCCCCCCCC
Oil Ring	CCCCCCCCCCCCCCCCCCCC

**Caterpillar C-13
Engine Oil Test
Rating Summary: Piston No. 3
Form 17**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM	
Test Number: CCC			
Oil Code: CCC			
Formulation / Stand Code: CC-C-CCCCCCCCCCCC-C-C-CCCCCC-CC-CC-CCCC			
Date Rated: YYYYMMDD		Rater Initials: CCC	
		Verified By: CCC	

Total Piston Ratings Summary																	
	Grooves				Lands				Deposit Factor	Lands				Oil Cooling Gallery		Under Crown	
	No. 1 A, %	DEM.	No. 2 A, %	DEM.	No. 1 A, %	DEM.	No. 2 A, %	DEM.		No. 3 A, %	DEM.	No. 4 A, %	DEM.	No. 3 A, %	DEM.	No. 4 A, %	DEM.
C																	
A	HC - 1.0	S123	S123.12	S123	S123.12	S123	S123.12	S123	S123.12				S123	S123.12	S123	S123.12	
R	MC - 0.5	S123	S123.12										S123	S123.12			
B	LC - .25	S123	S123.12	S123	S123.12	S123	S123.12	S123	S123.12				S123	S123.12	S123	S123.12	
O																	
N	Total	S123	S123.12	S123	S123.12	S123	S123.12	S123	S123.12				S123	S123.12	S123	S123.12	
	8 - 9	S123	S123.12	S123	S123.12	S123	S123.12	S123	S123.12								
	7 - 7.9	S123	S123.12	S123	S123.12	S123	S123.12	S123	S123.12	7.5			S123	S123.12	S123	S123.12	
	6 - 6.9	S123	S123.12	S123	S123.12	S123	S123.12	S123	S123.12				S123	S123.12	S123	S123.12	
V	5 - 5.9	S123	S123.12	S123	S123.12	S123	S123.12	S123	S123.12	4.5			S123	S123.12	S123	S123.12	
A	4 - 4.9	S123	S123.12	S123	S123.12	S123	S123.12	S123	S123.12				S123	S123.12	S123	S123.12	
R	3 - 3.9	S123	S123.12	S123	S123.12	S123	S123.12	S123	S123.12				S123	S123.12	S123	S123.12	
N	2 - 2.9	S123	S123.12	S123	S123.12	S123	S123.12	S123	S123.12				S123	S123.12	S123	S123.12	
I	1 - 1.9	S123	S123.12	S123	S123.12	S123	S123.12	S123	S123.12	1.5			S123	S123.12	S123	S123.12	
S	>0 - 0.9	S123	S123.12	S123	S123.12	S123	S123.12	S123	S123.12				S123	S123.12	S123	S123.12	
H	Clean	S123	0	S123	0	S123	0	S123	0				S123	0	S123	0	
	Total	S123	S123.12	S123	S123.12	S123	S123.12	S123	S123.12				S123	S123.12	S123	S123.12	
Rating		S123.12	S123.12	S123.12	S123.12	S123.12	S123.12	S123.12	S123.12				S123.12	S123.12	S123.12	S123.12	
Location Factor		2	3	3	1	3										1	
Ind. Rating		S123.12	S123.12	S123.12	S123.12	S123.12	S123.12	S123.12	S123.12				S123.12	S123.12	S123.12	S123.12	
WDP		TGC				TLC				Unweighted Deposits				Top Land Flaked Carbon %			
S1234.1		S12.12	S12.12	S12.12	S12.12	S12.12	S12.12	S12.12	S12.12	S1234.1			S1234.1			S123456	
TGF		IGF %				TLHC %				Acc. Groove Fill %							
S12		S123	S12	S12	S12	S12	S12	S12	S12	S123			S123				

**Caterpillar C-13
Engine Oil Test
Rating Summary: Piston No. 5
Form 19**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM	
Test Number: CCC		Oil Code: CCC	
Formulation / Stand Code: CC-C-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC			
Date Rated: YYYYMMDD		Rater Initials: CCC	
		Verified By: CCC	

Total Piston Ratings Summary																	
	Grooves				Lands				Deposit Factor	Lands				Oil		Under Crown	
	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2	No. 1	No. 2		No. 3	No. 4	DEM.	A, %	DEM.	A, %	DEM.	A, %
C	DEM.	DEM.	DEM.	DEM.	DEM.	DEM.	DEM.	DEM.									
A	S123	S123	S123	S123	S123	S123	S123	S123									
R	S123	S123	S123	S123	S123	S123	S123	S123									
B	S123	S123	S123	S123	S123	S123	S123	S123								S123	S123.12
O																	
N	S123	S123	S123	S123	S123	S123	S123	S123								S123	S123.12
8 - 9	S123	S123	S123	S123	S123	S123	S123	S123									
7 - 7.9	S123	S123	S123	S123	S123	S123	S123	S123	7.5							S123	S123.12
6 - 6.9	S123	S123	S123	S123	S123	S123	S123	S123									
5 - 5.9	S123	S123	S123	S123	S123	S123	S123	S123	4.5								
4 - 4.9	S123	S123	S123	S123	S123	S123	S123	S123									
3 - 3.9	S123	S123	S123	S123	S123	S123	S123	S123									
2 - 2.9	S123	S123	S123	S123	S123	S123	S123	S123									
1 - 1.9	S123	S123	S123	S123	S123	S123	S123	S123	1.5								
>0 - 0.9	S123	S123	S123	S123	S123	S123	S123	S123									
H Clean	S123	0	S123	0	S123	0	S123	0								S123	0
Total	S123	S123	S123	S123	S123	S123	S123	S123								S123	S123.12
Rating	S123.12	S123.12	S123.12	S123.12	S123.12	S123.12	S123.12	S123.12								S123.12	S123.12
Location Factor	2	3	1	3													1
Ind. Rating	S123.12	S123.12	S123.12	S123.12	S123.12	S123.12	S123.12	S123.12								S123.12	S123.12
WDP	Unweighted Deposits				Top Land Flaked Carbon %												
S1234.1	S1234.1				S1234.56												
TGF	Acc. Groove Fill %																
S12	S123																

**Caterpillar C-13
Engine Oil Test
Supplemental Rating Summary: Piston No. 1
Form 21**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		

Deposit		Carbon				Varnish									
		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	1	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
	2	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
	3	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
Top Bottom And Back Of Rings	1	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
	2	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
	3	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
Top Ring Stuck			CCCCCCC	S123	%										
Top Ring Scuffed			CCC	S123	%										
Second Ring Stuck			CCCCCCC	S123	%										
Second Ring Scuffed			CCC	S123	%										
Oil Ring Stuck			CCCCCCC	S123	%										
Oil Ring Scuffed			CCC	S123	%										
Crown Scuffed			CCC	S123	%										
Skirt Scuffed			CCC	S123	%										
Liner Scuffed			CCC	S123	%										

**Caterpillar C-13
Engine Oil Test
Supplemental Rating Summary: Piston No. 2
Form 22**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		

Deposit		Carbon				Varnish									
		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	1	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
	2	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
	3	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
Top Bottom And Back Of Rings	1	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
	2	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
	3	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
Top Ring Stuck			CCCCCCC	S123	%										
Top Ring Scuffed			CCC	S123	%										
Second Ring Stuck			CCCCCCC	S123	%										
Second Ring Scuffed			CCC	S123	%										
Oil Ring Stuck			CCCCCCC	S123	%										
Oil Ring Scuffed			CCC	S123	%										
Crown Scuffed			CCC	S123	%										
Skirt Scuffed			CCC	S123	%										
Liner Scuffed			CCC	S123	%										

**Caterpillar C-13
Engine Oil Test
Supplemental Rating Summary: Piston No. 3
Form 23**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		

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	1	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
	2	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
	3	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
Top Bottom And Back Of Rings	1	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
	2	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
	3	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
Top Ring Stuck			CCCCCCC	S123	%										
Top Ring Scuffed			CCC	S123	%										
Second Ring Stuck			CCCCCCC	S123	%										
Second Ring Scuffed			CCC	S123	%										
Oil Ring Stuck			CCCCCCC	S123	%										
Oil Ring Scuffed			CCC	S123	%										
Crown Scuffed			CCC	S123	%										
Skirt Scuffed			CCC	S123	%										
Liner Scuffed			CCC	S123	%										

**Caterpillar C-13
Engine Oil Test
Supplemental Rating Summary: Piston No. 4
Form 24**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCC-C-C-CCCC-CC-CC-CCCC		

Deposit		Carbon				Varnish									
		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	1	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
	2	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
	3	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
Top Bottom And Back Of Rings	1	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
	2	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
	3	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
Top Ring Stuck			CCCCCCC	S123	%										
Top Ring Scuffed			CCC	S123	%										
Second Ring Stuck			CCCCCCC	S123	%										
Second Ring Scuffed			CCC	S123	%										
Oil Ring Stuck			CCCCCCC	S123	%										
Oil Ring Scuffed			CCC	S123	%										
Crown Scuffed			CCC	S123	%										
Skirt Scuffed			CCC	S123	%										
Liner Scuffed			CCC	S123	%										

**Caterpillar C-13
Engine Oil Test
Supplemental Rating Summary: Piston No. 5
Form 25**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		

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	1	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
	2	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
	3	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
Top Bottom And Back Of Rings	1	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123		
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123		
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123		
	2	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123		
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123		
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123		
	3	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123		
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123		
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123		
Top Ring Stuck			CCCCCCC	S123	%										
Top Ring Scuffed			CCC	S123	%										
Second Ring Stuck			CCCCCCC	S123	%										
Second Ring Scuffed			CCC	S123	%										
Oil Ring Stuck			CCCCCCC	S123	%										
Oil Ring Scuffed			CCC	S123	%										
Crown Scuffed			CCC	S123	%										
Skirt Scuffed			CCC	S123	%										
Liner Scuffed			CCC	S123	%										

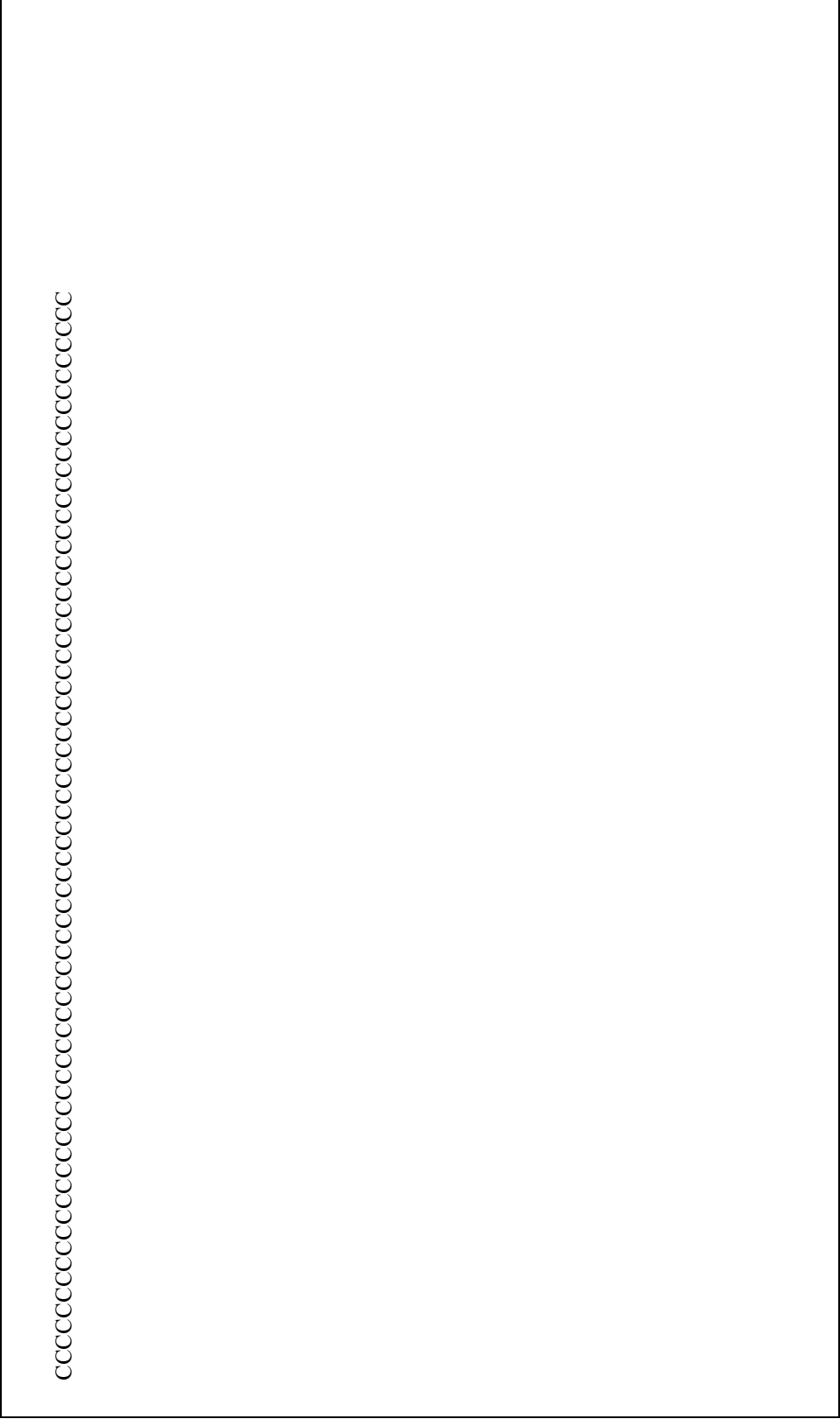
**Caterpillar C-13
Engine Oil Test
Supplemental Rating Summary: Piston No. 6
Form 26**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Oil Code: CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC		
Formulation / Stand Code: CC-CCCCCCCCC-C-C-CCCCC-CC-CC-CCCC		

Deposit		Carbon				Varnish									
		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	1	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
	2	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
	3	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123
Top Bottom And Back Of Rings	1	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
	2	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
	3	T	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		B	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
		BK	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	S123	
Top Ring Stuck			CCCCCCC	S123	%										
Top Ring Scuffed			CCC	S123	%										
Second Ring Stuck			CCCCCCC	S123	%										
Second Ring Scuffed			CCC	S123	%										
Oil Ring Stuck			CCCCCCC	S123	%										
Oil Ring Scuffed			CCC	S123	%										
Crown Scuffed			CCC	S123	%										
Skirt Scuffed			CCC	S123	%										
Liner Scuffed			CCC	S123	%										

**Caterpillar C-13
Engine Oil Test
Oil Consumption Plot
Form 27**

Laboratory: CC	EOT Date: YYYYMMDD	EOT Time: HH:MM
Test Number: CCC		
Oil Code: CCC		
Formulation / Stand Code: CC-CCCCCCCCCC-C-C-CCCCCC-CC-CC-CCCC		



CC

**100 – 150 h
Oil
Consumption:**
S12.12

**450 – 500 h
Oil
Consumption:**
S12.12

% Increase:
S123.1

Test Hours