

**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		
Stand:	Stand Run No.:	
End of Test Date:	End of Test Time:	
Oil Code / CMIR: ^A		
Formulation / Stand Code: ^B		
Altcode 1:	Altcode 2:	Altcode 3:

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.

^A CMIR or Non-Reference Oil Code ^B ACC-Registered Tests Only

Submitted By: _____

Testing Laboratory

Signature

Typed Name

Title

**Caterpillar C-13
Engine Oil Test**

**Form 2
Table of Contents**

1. Title / Validity Declaration Page	Form 1
2. Table of Contents	Form 2
3. Summary of Test Method	Form 3
4. Test Results Summary	Form 4
5. Operational Summary	Form 5
6. Oil Analysis Summary	Form 6
7. Unscheduled Downtime & Maintenance Summary	Form 7
8. Test Fuel Analysis (Last Batch)	Form 8
9. Build-Up and Hardware Information	Form 9
10. Piston Rating Summary	Form 10
11. Piston 1 Deposit Ratings	Form 11
12. Piston 2 Deposit Ratings	Form 12
13. Piston 3 Deposit Ratings	Form 13
14. Piston 4 Deposit Ratings	Form 14
15. Piston 5 Deposit Ratings	Form 15
16. Piston 6 Deposit Ratings	Form 16
17. Piston 1 Rating Summary	Form 17
18. Piston 2 Rating Summary	Form 18
19. Piston 3 Rating Summary	Form 19
20. Piston 4 Rating Summary	Form 20
21. Piston 5 Rating Summary	Form 21
22. Piston 6 Rating Summary	Form 22
23. Oil Consumption Plot	Form 23
24. Ring Weight Loss	Form 24
25. ACC Conformance Statement	Form 25

**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.

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	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**

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

Date Test Started				
Start Time				
Test Length				
Laboratory Oil Code				
TMC Oil Code ^A				
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				
	TGC (demerits)	TLC (demerits)	2nd Ring Top Carbon (demerits)	Oil Consumption Delta (g/h)
Original Result				
Transformed Result ^B				
Correction Factor ^B				
Corrected Transformed Result ^B				
Final Transformed Result ^B				
Final Result				
Merits				
Total Merits				

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				
	TGC (demerits)	TLC (demerits)	2nd Ring Top Carbon (demerits)	Oil Consumption Delta (g/h)
Final Result				

^A Reference Tests Only

^B 2nd Ring Top Carbon and Oil Consumption Delta Values in Transformed Units

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

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

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

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

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

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

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

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

Measurement	Specs.	Analysis		Test Method
		New	EOT	
Total Sulfur, ppm	7 – 15			D 5453
Gravity, °API	34 – 37			D 4052
Hydrocarbon Composition				
Aromatics, % Weight	26 – 31.5			D 5186
Olefins, % Volume	Report			D 1319
Cetane Index	Report			D 976
Cetane No.	43 – 47			D 613
Copper Strip Corrosion	1 Maximum			D 130
Flash Point, °C	54 Minimum			D 93
Pour Point, °C	-18 Maximum			D 97
Carbon Residue on 10% Residuum, %	0.35 Maximum			D 524 (10% Bottoms)
Water & Sediment, % Volume	0.05 Maximum			D 2709
Viscosity, cSt @ 40°C	2.0 – 2.6			D 445
Total Acid Number	0.05 Maximum			D 664
Strong Acid Number	0.00 Maximum			D 664
Accelerated Stability	1.5 max			D 2274
Ash, % Weight	0.005 Maximum			D 482
SLBOCLE, g	3100 min^A			D 6078^A
90% Distillation, °C	282 – 338			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 9**

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

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

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

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

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

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**

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

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																					
WDP		TGC				TLC				Unweighted Deposits				Top Land Flaked Carbon %							
TGF		IGF %				TLHC %				Acc. Groove Fill %											

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

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

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																				
WDP		TGC				TLC				Unweighted Deposits				Top Land Flaked Carbon %						
TGF		IGF %				TLHC %				Acc. Groove Fill %										

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

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

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																			
	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																				
WDP				TGC				TLC				Unweighted Deposits				Top Land Flaked Carbon %				
TGF				IGF %				TLHC %				Acc. Groove Fill %								

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

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

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																				
WDP				TGC				TLC				Unweighted Deposits				Top Land Flaked Carbon %				
TGF				IGF %				TLHC %				Acc. Groove Fill %								

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

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

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																				
WDP				TGC				TLC				Unweighted Deposits				Top Land Flaked Carbon %				
TGF				IGF %				TLHC %				Acc. Groove Fill %								

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

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

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																				
WDP				TGC				TLC				Unweighted Deposits				Top Land Flaked Carbon %				
TGF				IGF %				TLHC %				Acc. Groove Fill %								

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

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

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
Rating Summary: Piston No. 6
Form 22**

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

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**

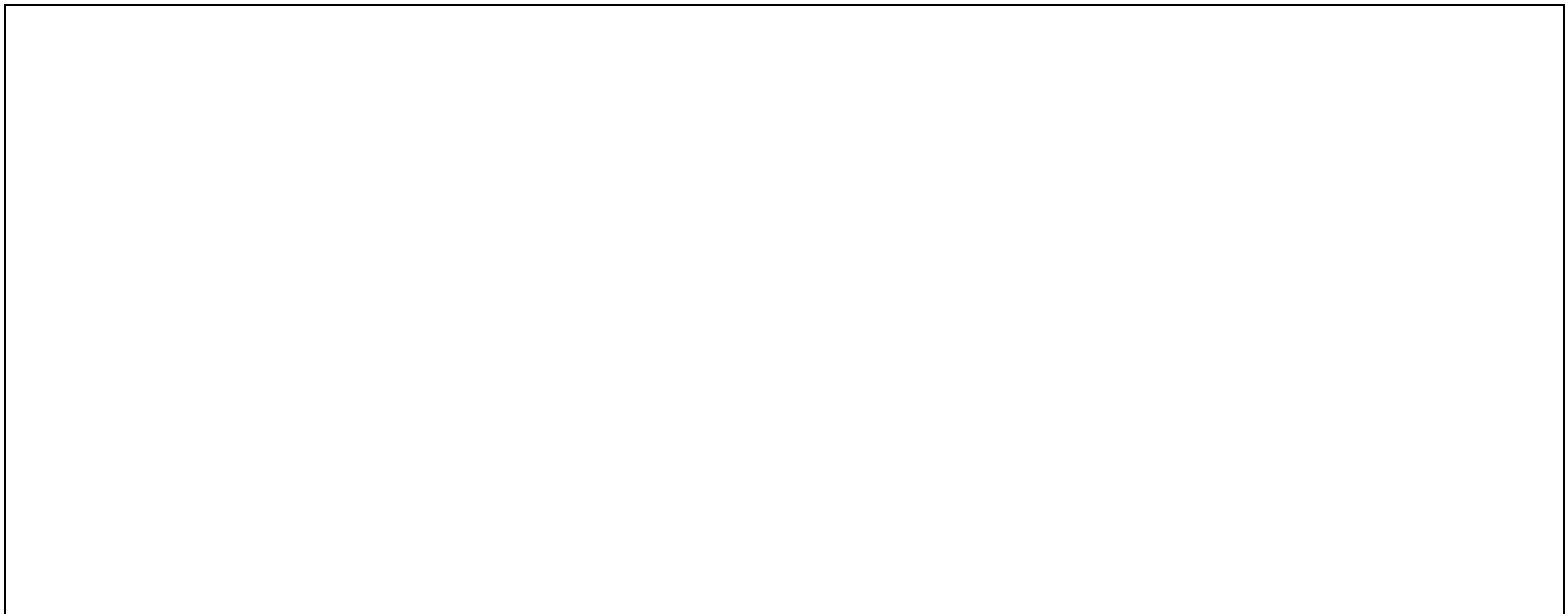
Laboratory:	EOT Date:	EOT Time:
Test Number:		
Oil Code:		
Formulation / Stand Code:		

Test Hours	50	100	150	200	250	300	350	400	450	500
Oil Consumption, g/h										
R²										

**100 – 150 h
Oil
Consumption:**

**450 – 500 h
Oil
Consumption:**

Delta OC:



Test Hours

**Caterpillar C-13
Engine Oil Test
Form 24
Ring Weight Loss**

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

Cylinder No.	Top Ring SOT Weight, g	Top Ring EOT Weight, g	Weight Loss, mg
1			
2			
3			
4			
5			
6			

**Caterpillar C-13
Engine Oil Test
Form 25
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.*

Comments

Signature

Date

Typed Name

Title