

HEAVY-DUTY ENGINE OIL CLASSIFICATION PANEL OF

ASTM D02.B0.02

October 9, 2025

Hilton Chicago O'Hare Airport – Chicago, IL

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ACTION ITEMS

MINUTES

1.0 Call to order

- 1.1 The Heavy Duty Engine Oil Classification Panel (HDEOCP) was called to order by Chairman Shawn Whitacre at 9:00 a.m. on Thursday, October 09, 2025, in the International Room of the Hilton Chicago O'Hare Airport, Chicago, IL.
- 1.2 The attendance list is included as Attachment 2.

2.0 Agenda

- 2.1 The agenda circulated prior (included as Attachment 1) was not changed.

3.0 Minutes

3.1 Exit Criteria Ballot for PC-12 (Attachment 3)

3.1.1 Sulfur Test Method

- 3.1.1.1 Oronite commented on inclusion of D5185 as an acceptable method on top of D4951 for Sulphur.
- 3.1.1.2 Infineum commented on what other sulfur methods would be allowable
 - 3.1.1.2.1 Group believes that the 2 methods are sufficient and align with other industry groups, so there was agreement on adding D5185 to the ballot

3.1.2 Foaming

- 3.1.2.1 Footnote from presentation material will be added based on comment from Oronite
- 3.1.2.2 Infineum commented asking if D892A is allowable, and this was consciously removed by the group in previous years and will not be added here.

3.1.3 HNBR Seal Material

- 3.1.3.1 Comments can be seen in the presentation material.
- 3.1.3.2 ACC made a note that Rate and Report would be for the life of the category. If the limit is set as rate and report now, there is no desire to change the requirement during the category life as it is effectively a new requirement.
 - 3.1.3.2.1 EMA does not have an objection to this and understands the difficulty of changing a requirement during the category.

- 3.1.3.2.2 EMA's goal is to maintain this as rate and report for the life of the category, and if an issue emerges in regard to seals then they may have to react.
 - 3.1.3.3 Agreement was made on maintaining rate and report.
- 3.1.4 C13 Requirement Hot Stuck Rings
 - 3.1.4.1 This will not be included to remain consistent with CK-4
- 3.1.5 ISBV COAT and DD13 clarify limiters
 - 3.1.5.1 Updates proposed to add $\geq$ or $\leq$ where appropriate
 - 3.1.5.2 Discussion on $\leq$ 35 yield stress
 - 3.1.5.2.1 There is not alignment between D4485 and API1509
 - 3.1.5.2.2 D4684 says if rotation occurs it should be reported as <35 (not equal to)
 - 3.1.5.2.3 Agreement that yield stress should stay as <35 in the limits
- 3.1.6 ISBV Test
 - 3.1.6.1 ACC recommendation to move to 6 cSt at 3.5% soot for PC-12A limits
 - 3.1.6.1.1 EMA's only question is what it means for backwards compatibility and licensing
 - 3.1.6.1.1.1 The new limit would be "equivalent" to T11 performance even at 6 cSt, it just changes the cSt requirement, not the soot requirement. The backwards compatibility should not be affected by this change
 - 3.1.6.1.2 No disagreement from the room for switching to 6 cSt, EMA agreeable to the change as well
 - 3.1.6.2 Comment from Oronite: Include a 108-hour result from a 156-hour test as long as the stand is dual calibrated
 - 3.1.6.2.1 After a long discussion, it was agreed that the soot/viscosity results would come from 108-hour test or 156-hour test for PC-12B or PC-12A respectively, and MRV can come from either test. The surveillance panel will discuss adding a Valid MRV box through 108 hours on the 156-hour test report with the goal of allowing a valid MRV result to come from a possibly invalid 156 hour soot/viscosity result.
 - 3.1.6.3 Tiered Limits (Attachment 4)
 - 3.1.6.3.1 Presentation given by Phil Scinto on tiered limits
 - 3.1.6.3.2 The discussion occurred around the T11-tiered limits vs the ISBV-tiered limits. The ISBV calculated tiered limits were larger drops in soot than the CK-4 T11-tiered limits, even though the ISBV has better precision than the current T11. The T11 limits were calculated based upon the precision of the test around TMC820, which were lower than the current reference oil's precision. The question arose around backwards compatibility, whether we would be "lowering the floor" from CK-4 since the precision of the T11 now doesn't match the tiered limits of CK-4. Essentially, the 3-Test MTEP for the T-11 is theoretically harder to pass than the 3-Test calculated MTEP of the ISB Viscosity. Some in the group desired the limits to be calculated as they have been historically as it is a new test and should be separate from anything done on the T11 through older categories. Others in the group believed that the bar would be lowered doing the historical calculation and the tiered limit should have been updated in older categories when the standard deviation of the T11 test changed.
 - 3.1.6.3.3 The group agreed to a "middle" tiered system and that a comment should be added around how this calculation was

done and the reason why it changed from historical calculations.

3.1.6.4 PC-12B Limit

3.1.6.4.1 No changes needed, just comments from Lubrizol and Infineum.

4.0 Membership

4.1 There were no membership changes.

5.0 Next meetings

5.1 ASTM Houston December 9th,2025.

6.0 The meeting was adjourned at 12:00 pm.

Joint ASTM HDEOCP and PC-12 NCDT Meetings Agenda

October 9, 2025

Date: October 9, 2025 Time: 9:00 AM to 3:00 PM		Chicago O'Hare Hilton International West Meeting Room Lower Level
9:00 AM – 9:15 AM	<u>International Center Meeting Room Lower Level</u> <u>Welcome/Safety Briefing</u> - Record Meeting Attendance - API Anti-Trust - Meeting's Agenda	
9:15 AM – 12:00 PM	<u>ASTM HDEOCP Meeting</u>	
9:15 AM – 10:15 AM	1. <u>Presentation Straw Poll Results</u> - Straw Poll Responses - Analysis of Responses - Any New Responses	
10:15 AM – 11:15 AM	2. <u>Discussion and Resolution</u> - Resolve all differences. - Outline the HDEO Specification	
11:15 AM – 12:00 PM	3. <u>Prepare to Issue ASTM Exit Ballot</u> Preparation for Issuing Exit Criteria Ballot	
12:00 PM	Lunch	
1:00 PM – 3:00 PM	PC-12 NCDT Meeting	
	1. <u>PC-12 ISB BOI/VGRA Status</u> - ISB Wear Test BOI/VGRA - ISB Wear Matrix - Update HBNR Seal Data 2. Preparation for December Ballot - Targets for December Meeting	

Note: Agenda Times and Order are for reference only and subject to change.

They are not reliable indicators of when topics will be discussed and should not be used to schedule times to attend the meeting.

LastName	FirstName	Company
Alessi	Michael	ExxonMobil F&L
Andersen	Jason	PACCAR Technical Center
Bachelder	Dennis	API
Baldrige	Anthony	Phillip 66
Birnbaumer	Laura	Chevron Oronite
Brass	David	Infineum
Cabaj	Mike	Daimler Truck NA
Campbell	Bob	Afton Chemical Corporation
Chao	Ken	CNH Industrial
Cisneros	Lizbeth	Motiva Enterprises, LLC
DeBaun	Heather	Navistar, Inc.
Deegan	Michael	Ford Motor Co.
Delp	Lynsie	Caterpillar Inc.
Franklin	Joe	Intertek Automotive Research
Freeman	Traci	Afton Chemical Corporation
Garling	Gary	Lubrizol
Gibbons	Greer	Lubrizol
Girard	Luc	Sanjuro Consulting
Gupta	Ashu	John Deere
Haffner	Steve	SGH Consulting / NOVVI
Haumann	Karin	Shell
Huang	Chung-Hsuan	CNH
Jetter	Steven	ExxonMobil
Kalberer	Eric	Shell
Ketcham	Stephen	Chevron
Koglin	Cory	Afton Chemical Corporation
Kress	Kyle	Phillips 66
Lanctot	Dan	TEI
Lee	David	Chevron Oronite
Lochte	Michael	Southwest Research Institute
Madalian	Michael	Infineum
Martinez	Jo	Chevron Oronite
McCollum	Clarence	Richful
McLaughlin	Michael	BP Castrol
Moyer	Sean	Test Monitoring Center
Petraroia	Mark	Total Energies
Purificati	Darryl	HF Sinclair
Qin	Wei	Cummins Inc.
Scinto	Philip	Lubrizol

Slocum	Robert	The Lubrizol Corporation
Smith	Andrew	Infineum
Stockwell	Robert	Chevron Oronite
Styer	Jeremy	Vanderbilt Chemicals
Tonkel	Bruce	Valvoline
Ward	Josh	Intertek Automotive Research
Warden	Robert	Southwest Research Institute
Whitacre	Shawn	Chevron Lubricants
Wilson	Beth	API
Zhang	Yanshi	Lubrizol
Zielinski	Chris	ExxonMobil
Ramasamy	Uma	Afton Chemical Corporation
Starling	Jose	SwRI
Grugel	Chad	EMA
Streck	Kevin	BP Castrol
Hippman	Ryan	PFUCHS Lubricants
Dang	Stefan	Safety-Kleen
Stone	Amanda	Afton Chemical Corporation
Fitzgerald	Sara	Afton Chemical Corporation
Miller	Sara	API
Scanlon	Gene	BASF
Denton	Ryan	Cummins Inc.
Carlson	Sue	EMA Counsel
Petit	Mark	Evonik
Hauschild	Matthew	Evonik
Zreik	Khaled	GM
Dvorak	Todd	Infineum
Scott	Mark	Safety-Kleen

Exit-Criteria Ballot for PC-12

Shawn D. Whitacre

Chairman

Heavy-Duty Engine Oil Classification Panel

October 9, 2025

Chicago, IL



ASTM-HDEOCP Membership

Oil and Additive Companies		OEMs	
1	Shawn Whitacre - Chevron	1	Patrick Holmes – Volvo Powertrain
2	Steve Jetter – ExxonMobil	2	Wei Qin- Cummins Inc.
3	Karin Haumann - Shell	3	Mike Cabaj – Daimler Truck
4	Mike McLaughlin - BP Castrol	4	Lynsie Delp - Caterpillar Inc.
5	Bruce Tonkel – Valvoline Global Op.	5	Heather DeBaun – Navistar
6	Eugene Scanlon - BASF	6	Ashu Gupta - John Deere
7	Mark Petit - Evonik	7	Stephen Kirby - General Motors
8	Cory Koglin – Afton	8	Jason Andersen- Paccar
9	David Lee – Chevron Oronite	9	Mike Deegan - Ford
10	Greer Gibbons– Lubrizol		
11	Michael Madalian- Infineum U.S.A.		
12	Kyle Kress - Phillips 66 Lubricants		
13	Mark Petraoia, TOTAL Lubricants		

Background

- **A comprehensive “Exit Criteria” ballot was issued to gauge member consensus on full proposed PC-12 specifications**
 - **Issue date:** September 11, 2025
 - **Due date:** October 2, 2025
- **Ballots were submitted by 14 out of 23 panel members, as well as from:**
 - Motiva Enterprises (Liz Cisneros)

Voting Summary

- **Primary stakeholder concerns were focused on:**
 - Test method for Sulfur (13)
 - Clarify “Rate & Report” for new HNBR seal material (45/46)
 - Clarify C-13 requirement (52)
 - Clarify DD13 Scuffing requirement (64)
 - ISBV limits and testing provision for 108-hr result (64, 65, 66)
 - Calculation of tiered limits
- **Detailed feedback on these and other negatives/comments are summarized on next slides**
- **Items that were unanimously AFFIRMATIVE are not referenced**

Sulfur Test Method (13)

	Chemical Limits			
11	Sulfated Ash (D874), max	%	0.9	0.9
12	Phosphorus (D4951 or D5185), max	%	0.08	0.08
13	Sulfur (D4951), max	%	0.3	0.3

- **Oronite** - In ASTM D4485, the method listed Sulfur measurement is the D4951. We're requesting the inclusion of D5185 as another acceptable method on top of D4951 for S measurement.
- **Infineum** –Add D5185 and D2622 as allowable sulfur methods (others?)

Foaming (17/18/19)

	Foaming (D892)			
	Foaming / Settling			
17	Sequence I, max	%	10 / 0	10 / 0
18	Sequence II, max	%	20 / 0	20 / 0
19	Sequence III, max	%	10 / 0	10 / 0

- **Lubrizol:** include footnote “Ten minutes for Sequence I, II, and III” as in current spec
- **Infineum:** Is D892A allowable?

New HNBR Seal Material (45/46)

	HNBR			
43	Volume Change	%	+10/-10	+10/-10
44	Hardness	Points	+12/-12	+12/-12
45	Tensile Strength	%	Rate & Report	Rate & Report
46	Elongation	%	Rate & Report	Rate & Report

- **Lubrizol** and **Oronite** – R&R for life of category
- **ExxonMobil** -We believe it would be preferred to define limits now as adding requirements later will be difficult and require waiting period. If precision of these parameters is wider, then consider using limits based on SL107 +/- some amount as done for several other seals parameters to ensure that performance of candidate is aligned with reference oil meant to set the baseline of acceptable performance
- **Lubrizol** Include Note at the top of the table: Note - These are the unadjusted specification limits for elastomer compatability. Candidate oils shall, however, conform to the adjusted specification limits, the calculation of which is described in Annex A5.

CAT C-13 Hot Stuck Rings

Item #	Specification	Units	Tiered Limits (PC-12A)			Tiered Limits (PC-12B)			Merit System Values			
			1 Test	2 Tests	3 Tests	1 Test	2 Tests	3 Tests	Max	Anchor	Cap	Weight
	Caterpillar C13 (D7549) (2)											
47	Merits, min		1000	1000	1000	1000	1000	1000	--	--	--	--
48	Top Land Carbon, average	%	--	--	--	--	--	--	15	30	35	300
49	Top Groove Carbon, average	%	--	--	--	--	--	--	30	46	53	300
50	Second Ring Top Carbon, average	%	--	--	--	--	--	--	5	22	33	100
51	Delta Oil Consumption	g/hr	--	--	--	--	--	--	10	25	31	300
52	Hot Stuck Piston Rings		None	None	None	None	None	None	--	--	--	--

- **ExxonMobil, Lubrizol, Chevron**
- The ballot erroneously included Hot Stuck Piston Rings, which was removed for CK-4
- **RECOMMENDATION:** Remove as per CK-4

ISBV (16) COAT (53) and DD13 (64)

- Ballot neglected to clarify limiters on COAT, DD13 Scuffing, and ISBV Yield Stress
- **Should be:**
 - (16) Yield Stress ≤ 35 Pa
 - COAT: Avg Aeration 40-50 hours, max (also needs updating in CK-4)
 - DD13 Scuffing: ≥ 31 hours (for 1/2/3 tests)

RECOMMEND updating as above

ISB Soot-Viscosity Test (64/65/66)

				Tiered Limits (PC-12A)			Tiered Limits (PC-12B)		
	ISB Soot-Viscosity Test (D8617) (3)								
64	%Soot at 4.0 mm ² /sec increase, min	%		2.6	2.4	2.3	-	-	-
65	%Soot at 12.0 mm ² /sec increase, min	%		5.6	5.4	5.3	4.8	4.6	4.5
66	%Soot at 15.0 mm ² /sec increase, min	%		5.7	5.5	5.4	-	-	-

- **Oronite- NEGATIVE** “move to ACC recommended 6 cSt at 3.5% soot window”
- **Afton, Chevron, ExxonMobil, Infineum** supportive of change to 6 cSt at 3.5%
- **SHELL – NEGATIVE** on multiple test limits (next slide)
- Numerous comments suggesting clarification that 108 hour result can come from 108 or 156 hr test; add D6896 for Sooted Oil MRV TP-1

ISB Soot-Viscosity Test (64/65/66)

				Tiered Limits (PC-12A)			Tiered Limits (PC-12B)		
	ISB Soot-Viscosity Test (D8617) (3)								
64	%Soot at 4.0 mm ² /sec increase, min	%		2.6	2.4	2.3	-	-	-
65	%Soot at 12.0 mm ² /sec increase, min	%		5.6	5.4	5.3	4.8	4.6	4.5
66	%Soot at 15.0 mm ² /sec increase, min	%		5.7	5.5	5.4	-	-	-

Shell Negative

While the analysis supporting the single test limits shows reasonable equivalency with the T-11 based on severity differences, further relaxing of the requirement through tiered limits introduces risk of passing underperforming oils. Furthermore, while the precision of the ISBV has been demonstrated as improved over that of the T-11, the reduction in tiered limits is greater than that of the T-11 existing today in CK-4. MTAC limits at the proposed 2.6, 5.6 and 5.7% at 4, 12 and 15 cSt respectively across multiple tests is a reasonable compromise position between the minority and majority ACC positions.

Lubrizol Affirmative Comment

PC-12B consider 4.5 limit due to ISBV more severe than T-11 and tying to performance of current RO

Infineum Affirmative Comment

Infineum supports a limit of 4.4 % soot to align with the reference oil TMC834 LTMS target

ExxonMobil Additional Comments

Item #	Comment
47-69	The limits should be presented as One-test, Two-test, Three-test rather than as "Tiered Limits" since many of the tests are not using the Tiered Limit approach for MTEP. Footnote to be applied to Two-test and Three-test to direct to Annex with information detailing the MTEP procedures or each test. Merit System Lables should be "Min, Anchor, Max, Weight" vs "Max, Anchor, Cap, Weight" to be consistent with current specs and terms used in D4485 calculation instructions.
64-69	We support the establishment of Tiered limits for these tests, but would like to have the data/calculations provided to NCDT for validation of the 2-test & 3-test limits before finalizing the specification propoasls. Seems like the amount of change between limits for T13 is ~double what is in CK-4/FA-4 so would like to understand why this is the case (different precision estimates used? just due to diffenet level of limits?)

Lubrizol Additional Comment

- Row 42 on engine test page: Currently listed as (2) MTAC accomplished by calculating merits based on averaged test results; should be (2) MTEP accomplished by calculating merits based on averaged test results

Additional OEM Comments

- **CATERPILLAR**

Although Caterpillar has consistently not been in agreement with the chemical box limits for PC-12A throughout category development, we recognize this is the industry direction and will not hold up category progress for this item.

- **FORD**

Ford will continue using CK-4 and implementing the VTW test and is assuming that there will be additional backwards compatibility for CK-4 licensed oils pertaining to the ISBV replacing the T-11, and T-12, 1N, and RFWT are still available.

Additional OEM Comments

- **PACCAR:**

- Would harmonizing with ACEA at 12% NOACK greatly impact category or better addressed with internal specification?
- 15: Limits vs worse case data 2x+ magnitude difference. Is this test providing any value if everything passes?
- 65: Low soot handling PC12b directionally OK. Data provided in NCDT seems limited for setting limits. Any risk more data will come out that could challenge these levels?

THANKS!

Oronite Comments for ISBV

October 9, 2025

Comments for PC-12 Exit Criteria Poll

- ISBV for API CL-4
 - “Negative” on 4 cSt soot window at 2.6% in favor of the 6 cSt soot window at 3.5%
 - The test is to measure sooted oil viscosity control
 - At 4 cSt soot window, the test doesn’t measure sooted viscosity increase. The 6 cSt window provides the needed sooted viscosity increase.
 - 6 cSt in the ISBV has the same amount of soot in the oil as 4 cSt in the T-11
 - Because of equal soot, there is no issue with backwards compatibility to CI-4+
- ISBV for API FB-4
 - Include a 108 hour result from a 156 hour test as long as the stand is dual calibrated.
 - Exists as an option right now at the independent laboratories, but is this updated in ASTM D8617?

Tiered Limits for ISB Viscosity Test

09 October 2025

What is a Tiered Limit?

- Tiered limit technique was introduced in the ACC Code of Practice in the 1990's to evaluate multiple tests on a formulation
 - Technique was first used to create tiered limits for API CF
- For test acceptance into the ACC Code of Practice, new tests must include a Multiple Test Evaluation Procedure - MTEP (i.e. MTAC, Tiered Limit Method - TLM, or MRS)
- Tiered limits account for test variability in determining performance
- Tiered limits are calculated by an established formulas with two key inputs: Gaussian distribution (z value) and standard deviation of performance

Tiered Limits for T-11 & ISB-Vis

T-11 Tiered Limits

T-11	One-test	Two-test	Three-test
Soot% @ 4 cSt	3.5	3.4	3.3
Soot% @ 12 cSt	6	5.9	5.9
Soot% @ 15 cSt	6.7	6.6	6.5

ISB Viscosity Tiered Limit Proposal

ISB-Vis	One-test	Two-test	Three-test
Soot% @ 4 cSt	2.6	2.4	2.3
Soot% @ 12 cSt	5.6	5.4	5.3
Soot% @ 15 cSt	5.7	5.5	5.4

- The tiers in ISB Viscosity test are larger than the tiers of the T-11
- The ISB Viscosity Test has demonstrated better precision than that of the T-11
- Since the ISB Viscosity test has a smaller standard deviation than the T-11, how are the tiers larger for the ISB Viscosity than that of the T-11??

Original Calculation of T-11 Tiered Limits

T-11 Reference Oil Targets											
Oil	n	Effective Dates		Soot @ 4.0 cSt Vis. Inc		Soot @ 12.0 cSt Vis. Inc		Soot @ 15.0 cSt Vis. Inc.		MRV Viscosity	
		From	To ¹	$\bar{X}$	S	$\bar{X}$	s	$\bar{X}$	s	$\bar{X}$	s
820-2	32	3-8-03	***	--	--	5.78	0.21	--	--	14969	1097
820-2	16	5-28-05	5-31-10	3.81	0.23	5.78 ²	0.21 ²	6.36	0.26	14969 ²	1097 ²
	-- ³	6-1-10	***	3.95	0.30	5.92	0.22	6.51	0.20	14981	916
820-3	11	9-7-07	***	3.95	0.30	5.92	0.22	6.51	0.20	14981	916
822-1	4	2-1-2013	7-2-2013	3.99	0.21	5.65	0.54	6.35	0.66	14408	314
	8	7-3-2013	***	4.09	0.20	5.81	0.50	6.48	0.61	13948	584
822-2	8	1-1-2014	7-29-2020	4.09	0.20	5.81	0.50	6.48	0.61	13948	584
	57	7-30-2020	***	4.09	0.20	5.81	0.50	6.48	0.61	13948	1156

- 1 *** = currently in effect
2 Value based on earlier data set (n=32)
3 Targets based on oil 820-3

- Two ROs were used for T-11: RO820 & RO822 (Replacement for RO820)
- RO820 was used to calculate the tiered limits for T-11 using the standard deviation of 0.21**
- RO820 has a much smaller standard deviation (0.21 for 12 cSt vis inc) than RO822 (0.5)**
- T-11 tiers are smaller due to the use of obsoleted RO820 which had a smaller estimated standard deviation at the time than RO822 has currently

Tiered Limits Calculation for T-1 1 Using RO822

Current T-11 Tiered Limits (RO820)

T-11	One-test	Two-test	Three-test
Soot% @ 4 cSt	3.5	3.4	3.3
Soot% @ 12 cSt	6	5.9	5.9
Soot% @ 15 cSt	6.7	6.6	6.5

T-11 Tiered Limits with RO 822

T-11 with RO822	One-test	Two-test	Three-test
Soot% @ 4 cSt	3.5	3.4	3.3
Soot% @ 12 cSt	6	5.7	5.6
Soot% @ 15 cSt	6.7	6.4	6.3

- T-11 tiered limits would have had a more significant reduction if RO822 was used to calculate the tiered limit
 - At 12cSt, the current limits of 6/5.9/5.9 would be 6/5.7/5.6

Options for ISB Viscosity

- Keep the [current proposal](#)

ISB-Vis	One-test	Two-test	Three-test
Soot% @ 4 cSt	2.6	2.4	2.3
Soot% @ 12 cSt	5.6	5.4	5.3
Soot% @ 15 cSt	5.7	5.5	5.4

- Use a [middle](#) tiered limit approach

ISB-Vis	One-test	Two-test	Three-test
Soot% @ 4 cSt	2.6	2.5	2.4
Soot% @ 12 cSt	5.6	5.5	5.4
Soot% @ 15 cSt	5.7	5.6	5.5

- Use a [non-scientific approach](#) – purely based on T-11 tiers (not run in ISBV)
 - Need to document the reasoning in the meeting minute & footnote in D4485 & API 1509

ISB-Vis with R0820	One-test	Two-test	Three-test
Soot% @ 4 cSt	2.6	2.5	2.5
Soot% @ 12 cSt	5.6	5.5	5.5
Soot% @ 15 cSt	5.7	5.6	5.6

Non-Ideal Option for ISB Viscosity

- Use MTAC – same limit regardless of the number of runs
 - Breaks away from tiered limit tradition for soot viscosity tests (T-8, T-8E, & T-11)
 - Concerns for backwards compatibility – older categories have tiered limits

ISB-Vis	One-test	Two-test	Three-test
Soot% @ 4 cSt	2.6	2.6	2.6
Soot% @ 12 cSt	5.6	5.6	5.6
Soot% @ 15 cSt	5.7	5.7	5.7

Summary of Tiered Limits

- Tiered limits were introduced in API CF category
- Values for tiered limits are calculated using an established formula with two key inputs: Gaussian distribution (z value) and standard deviation of performance of test
- The ISB Viscosity test should follow historical precedence and use tiered limits to maintain linkability to older category performance (i.e. T-8 and T-11 equivalency)
- The T-13 tiered limits were calculated using the same established formula as the ISB Viscosity but with the standard deviations for the T-13 test