



Latest Development on GC-LB Specification

**NLGI India Chapter
22nd Annual Conference
1-3 February, 2020
Indore, India**



GC-LB Specification: Past and Present

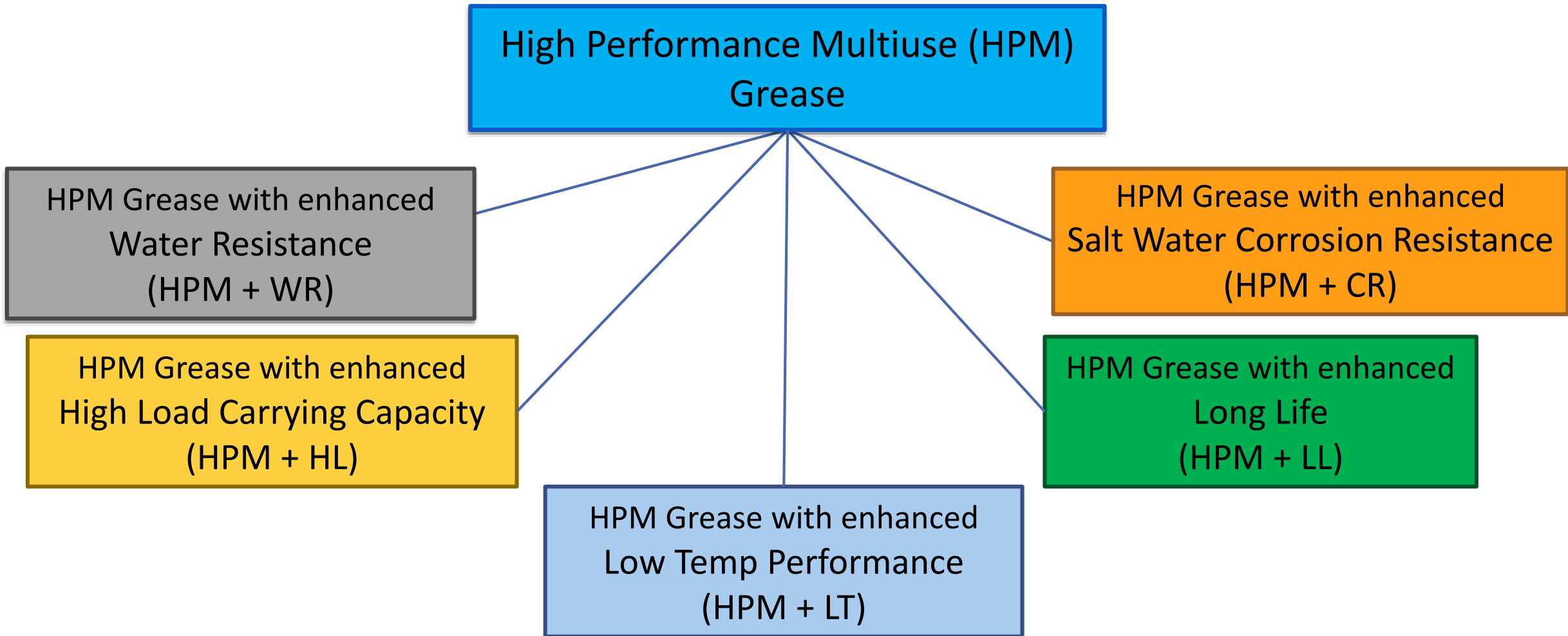
- NLGI currently licenses grease through their Certification Mark program which includes the well-known GC-LB Performance Classification.
- The GC-LB specifications were developed beginning in 1969 and published in 1989 as ASTM D4950
- This certification program has provided an internationally-recognized grease specification for grease and bearing manufacturers, users and consumers since that time.
- Today, 304 total products licensed by 85 different companies
 - Approximately 10% increase in licenses since May 2014
 - Majority (82%) meet GC-LB spec
- Although originally conceived as an automotive chassis and wheel bearing specification, GC-LB today is recognized as a mark of quality for grease specifiers.
- Due to advancements in materials, technologies and applications, NLGI recognizes that current applications may be better served by updated specifications.



High Performance Multiuse (HPM) Grease Specifications

- Overall Goal: Define a new grease specification with higher performance
 - Will **NOT** replace GC-LB
- Additional Goal: Define greases that meet HPM specification **and** sub-categories with tests and limits for *enhanced performance*:
 - Enhanced Water Resistance (WR)
 - Enhanced Load Carrying Capacity (HL)
 - Enhanced Salt Water Corrosion Resistance (CR)
 - Enhanced Long Life (LL)
 - Enhanced Low Temperature (LT)

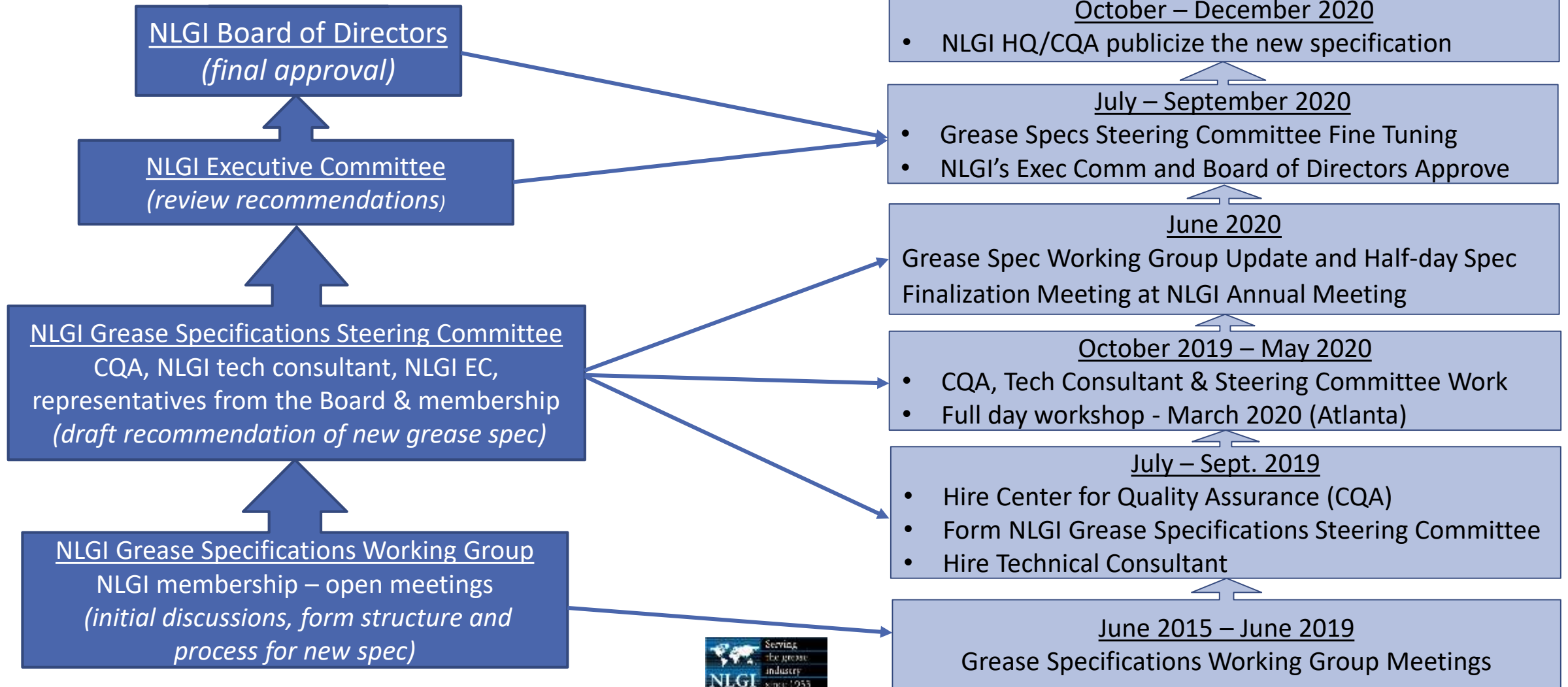
NLGI's Future High Performance Multiuse Grease Classifications





Serving
the grease
industry
since 1933

Grease Specification Governance Structure and Timeline



High Performance Multiuse (HPM): Present work

- Gather feedback from all stakeholders through interviews and discussion throughout grease industry
 - End-users, OEMs, marketers, grease manufacturers, equipment manufacturers
 - Primarily driven by Center for Quality Assurance (CQA) and NLGI technical consultant, Chuck Coe (Grease Technology Solutions)
- Use draft specification to promote discussion but listen and capture feedback
 - Continuously modify draft as consensus emerges
 - Monthly meetings of Steering Committee
- Full day workshop in March (Atlanta) to begin formation of final draft
 - Discussion of feedback gathered, “troubled” tests, spec limits
- Refine draft and finalize through Steering Committee and continued discussion w/stakeholders
 - Final ½ day meeting at June Annual Meeting

High Performance Multiuse (HPM) Grease Specification – Part 1

Property	Test method	Units	Minimum	Maximum	Source
Consistency class	D217		220 – 250 (#3); 265 – 295 (#2); 310 – 340 (#1)		ASTM D4950
Prolonged worked penetration (Δ 100k)	D217	dmm		#3 = +30 #2 = +40 #1 = +50	Test data
NBR (Acrylonitrile-butadiene) and CR (Chloroprene) appear to be good focus. Are there other materials applicable to the base specification? Is time/temp applicable?					
Elastomer compatibility NBR 28PX (ISO 13226)	D4289* modified with change in tensile/elongation from ASTM D471 (70 hours 100°C)	Δ Hardness (Shore A) Δ Volume percent Δ Ultimate Tensile strength (%) Δ Elongation at Break (%)	-15 -5 -50 -50	+5 +30 +50 +50	ASTM D4950 ISO 13226 and ASTM D2000
Oxidation Stability (pressure drop)	D942	kPa (psi)		35.0 (5.0)	General automotive specs
Water washout	D1264	wt%		#3 = max 4.0 (? Sig figures) #2 = max 8.0 #1 = max 12.0	ASTM D4950
LT Torque at -20 °C Starting torque Running torque	D1478	Ball bearing (D1478) vs. tapered bearing (D4693). mNm (g·cm)		1000 (10,200) 100 (1020)	ISO 12924

Temperature set to -20 °C for HPM main spec. See Low Temp sub-category for -40 °C testing

High Performance Multiuse Grease Specification – Part 2

Property	Test method	Units	Minimum	Maximum	Source
Static oil bleed (by NLGI grade)	D1742	wt%		#3 = 4.0 #2 = 6.0 #1 = 8.0	Test data
HT Bleed (by NLGI grade)	D6184	wt%		#3 = 4.0 #2 = 6.0 #1 = 8.0	Test data
Roll stability (2 hours at RT)	D1831	dmm		<30 all grades	Test data
Dropping Point	D2265	°C	No limits will be defined.		NLGI #1925
Because many applications are not at high temperature conditions, consensus is forming to eliminate Dropping Point from the spec. Manufacturers may report on data sheets.					
4-Ball Wear Scar Diameter	D2266	mm		0.60	ASTM D4950
4-Ball EP Weld point Load wear Index (LWI)	D2596	kg	250 (weld point) 45 (LWI)		ASTM D4950
There is growing consensus to eliminate LWI from the specification.					
Rust rating	D1743	rating	Pass		ASTM D4950
Copper corrosion (24 hours 100 °C)	D4048	rating		1B	General specifications

Any feedback on the Roll Stability conditions? See Long Life for harsher conditions.

Because many applications are not at high temperature conditions, consensus is forming to eliminate Dropping Point from the spec. Manufacturers may report on data sheets.

Is 0.60 a good limit? Is 0.55 "challenging but achievable?"

Consensus 250 kg minimum for HPM grease

There is growing consensus to eliminate LWI from the specification.

High Performance Multiuse Grease with enhanced Water Resistance (HPM + WR)

As a high performance multi-use grease but with following additions

- D1264 washout with tighter limits
- D4049 spray off
- D7342 Wet penetration stability
- D8022 Wet roll stability

These spray off limits are new and based upon grease consistency. The proposed limits need to be finalized.

Property	Test method	Units	Minimum	Maximum	Source
Water washout	D1264	wt%		#3 = 3.0 #2 = 5.0 #1 = 8.0	Test data
Water spray off	D4049	wt%		#3 = 20-25 #2 = 40-50 #1 = 60-75	Test data
Wet penetration stability (Penetration change, ΔW100k)	D7342	dmm		50	Test data
Wet roll stability (Penetration change)	D8022	dmm		50*	Test data

*Converted from ½ scale units

High Performance Multiuse Grease with enhanced Salt Water Corrosion Resistance (HPM + CR)

- Meeting the foundational HPM grease spec but with following additions
 - – D5969 and D6138
 - – D5969 is a static test whereas D6138 Emcor tests are dynamic.

Property	Test method	Units	Minimum	Maximum	Source
Bearing rust 10% synthetic seawater	D5969	rating	Pass		General specifications
Emcor rust 100% Synthetic seawater	D6138	rating		1/2	General specifications
Emcor rust ~3% NaCl solution (0.5 N solution)	D6138	rating		2/3	General specifications

The maximum limits were relaxed and seem more realistic now. Feedback?

High Performance Multiuse Grease with Enhanced High Load Carrying Capacity (HPM + HL)

Property	Test method	Units	Minimum	Maximum	Source
4-Ball Wear Wear scar diameter	D2266	mm		0.50	General specifications
4-Ball EP Weld point Load wear Index (LWI)	D2596	kg	400 55-60		General specifications
SRV step Load	D5706	N	1200		General specifications
Fretting wear (weight loss)	D4170* * Average of two duplicate runs	mg		5.0	General specifications
Fretting wear scar by SRV	D7594	μm		tbd	Developing specifications

The base HPM grease spec is 250 min, and the +HL category is proposed to be 400 min for high load.

(1) Feedback about 5.0 using two duplicate runs? (2) Is fretting wear data useful for your application?

Is LWI meaningful? Consensus is to remove LWI from the spec.

Comments?

If SRV test is required, where would you obtain the data?

NOTE: Timken OK Load is removed from the HPM spec. Marketers can report on their data sheet if they want.

High Performance Grease with Enhanced Low Temperature Performance (HPM + LT)

As a multiuse grease but with following additions

- Lower limits D1478
- Low temperature D4170
- Low temperature U. S. Steel Mobility
- Low temperature flow test (DIN 51085)

Property	Test method	Units	Minimum	Maximum	Source
LT Torque at -40 °C Starting torque Running torque	D1478	mNm (g·cm)		TBD TBD	General specifications
Fretting wear (weight loss) @ -18C	D4170* (Ave of 2 runs)	mg		TBD	General specifications
U. S. Steel Mobility @ -18C	LT-37	gm/min	TBD		General specifications
Low Temperature Flow Test	DIN 51805	psi (?)		TBD	DIN Classification

High Performance Multiuse Grease with Enhanced Long Life (HPM + LL)

NOTE: Because of the test development required, this long life spec will not be completed by year 2020. However, NLGI expects the other specifications to be finalized. The feedback being gathered here will be used to guide test method development as well as long life specification tests/limits but will likely take more years to finalize.

Property	Test method	Units	Minimum	Maximum	
4-Ball Wear Wear scar diameter	D2266	mm		0.50	General specifications
Fretting wear (weight loss)	D4170** Average of two duplicate runs	mg		5.0	General specifications
Fretting wear scar by SRV	D7594	µm		tbd	Developing specifications
Oxidation Stability (pressure drop)	D942	kPa (psi)		20.0 (3.0)	General specifications
New Grease Life test method (TBD)	D8XXX	hours	TBD		Being developed by ASTM
What types of bearings require long life grease (what bearing type/geometry are applicable)?					
High temperature roll stability (50 hrs at 80°C)	D1831 (modified)			TBD	
High temperature elastomer compatibility (70 hours at 150°C)	D4289* modified with change in tensile/elongation from ASTM D471	ΔHardness (Shore A) Δ Volume percent Δ Ultimate Tensile Strength (%) Δ Elongation at Break (%)	-15 -5 -50 -50	+5 +30 +50 +50	ASTM D4950 ISO 13226 and ASTM D2000

High Performance Multiuse (HPM) Spec: Future plan

- Implement licensing and audit program beginning in 2021
- CQA will take over audit, testing and certification process
 - Allows better oversight of grease quality
 - Adds rigor and value to Certification holders
 - Independent body
- NLGI will continue to work with ASTM and stakeholders to introduce new specifications categories as needed and able
 - Enhanced Long Life – need High Temperature test development (2-5 years)
 - Electric motor bearings, open gears, marine, railroad, food grade
 - Need to gauge interest among marketers and end users

GC-LB Specification: Future plan

- Goal: Resolve test issues with current GC-LB specification working with ASTM and stakeholders
 - Reproducibility – D3527 High temp bearing test
 - Reproducibility – D4170 Fafnir fretting wear test
- NLGI will keep GC-LB licensing active
 - Many specifications reference the GC-LB requirements
 - Many marketers find value in the Certification Mark
- CQA will take over audit, testing and certification process for GC-LB, as well as HPM
- GC-LB will remain active for as long as there is a desire in the market

Thank you!



To provide feedback, please contact CQA or Grease Technologies Inc.

CQA contact: Mike Kunselman / YoVonne Starks. E-mail: Grease@CenterForQA.com Ph. 989.496.2399

Grease Technologies, LLC. contact: Chuck Coe. E-mail: chuckcoe@Grease-Tech.com Ph. 540.338.8040

Learn more about NLGI at www.NLGI.org