Document GRB-68-24
Agenda item 19

U.S. TIRE MANUFACTURERS ASSOCIATION

LIGHT TRUCK / C-TYPE HARMONIZED HIGH SPEED TEST

Status and Recommendation for GTR No. 16

GRBP September 2018

High Speed Test for LT/C type Tyres

- 2014: GTR No. 16 (Tyre GTR) adopted with non-harmonized provisions for LT/C type tyres
- Phase 2: Working to harmonize high speed test for LT/C type tyres
- Two high speed tests listed in Tyre GTR:
  - UNECE R 30 high speed test
  - USA FMVSS 139 high speed test
- Key test components that affect test severity:
  - Test load
  - Test temperature
  - Test inflation pressure

Harmonization Goal:

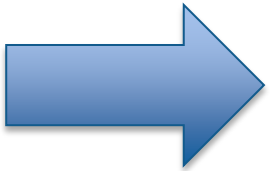
Where multiple tests exist, select most severe test for each tyre type

Assessment Method:

For high speed test, assess test severity by speed rating

Approach for Passenger Car Tyre HS Test Harmonization

- Analysis UNECE Reg 30 HS test to the FMVSS 139 HS test
  - For passenger tyres with speed symbol (“SS”) >/= T, agreed that Reg 30 HS was more severe
  - For passenger tyres with SS </= S, agreed that FMVSS 139 HS was more severe
- GTR-Tyres specifies these HS requirements in clauses 3.11.3 and 3.11.4
- The HS analysis and agreement was based on testing tyres until reaching an ‘end of test’ condition and reporting the number of test steps above the appropriate minimum speed level (Steps Above Limit)



Industry used same approach to assess HS test for LT/C type tyres

Non-harmonized High Speed Tests for LT/C type Tyres

	FMVSS139		UNECE R 54	
Test Drum	1.7 m with 1% tolerance		1.7 m (or 2m) with 1% tolerance	
Test Load	85% Max Load as stamped on tire		90% (or 92%) of the load corresponding to the LI	
Inflation	based on LR and section width Load Range C ..... 320 Load Range D ..... 410 Load Range E ..... 500 Light truck tires with a nominal cross section > 295 mm Load Range C ..... 230 Load Range D ..... 320 Load Range E ..... 410 ~91%		corresponding to the pressure index specified by mfg **("PSI" index stamped on sidewall)** ~100%	
Temperature	Min 32C and Max 38C		20 - 30° C or higher	
Procedure	Min	Speed (kph)	Min	Speed (kph)
	120	80 kph ~240 min	10	from zero to initial test speed 60 min
	~60	cooldown to 38C, readjust inflation	10	initial test speed = speed corresponding to the speed category symbol less 20 km/h
	30	140	10	initial test speed +10 km/h
	30	150	30	speed corresponding to the speed category symbol
	30	160		

Initial Assessment of LT/C HS Test Severity

- Earlier data mining, analyses and limited testing (circa 2013) validated:
  - SS >/= S ECE Reg 54 HS was more severe
  - SS </= Q FMVSS 139 HS was more severe
  - SS = R relative severity was inconclusive
- ECE Reg 54 HS Test is a more 'efficient' test
  - Does not include 2 hour break-in and resulting cool down (FMVSS 139 carry over provision from bias tyres; no longer justified)
  - 60 minute Reg 54 test duration vs 90 minute FMVSS 139
  - ***Over 3 hour shorter duration test***

Industry test program for SS </= R (2017)

- Agreed to validate for SS Q; apply same solution for SS R
- Tested all tyres to SS Q limit (160 km/h) regardless of actual tyre speed symbol
- Increased temperature of Reg 54 HS test to 38°C ambient to increase test severity
- All results based on SAL test analysis (same as earlier passenger tyre HS test analysis)
- SAL for both Modified Reg 54 & FMVSS 139: 10 minutes @ + 5 km/h

Testing Summary (2017)

- Seven Manufacturers / test locations
- 29 tyre pairs tested (1 to FMVSS 139; 1 to Modified Reg 54)
- Wide variety of tyres representative of global market:
  - 17 C-type tyres
  - 11 LT-Metric
  - 1 High Flotation

- Tyre Types in Study:
  - 13 “Summer” (normal tyres)
  - 6 Winter (3PMSF; includes one all-terrain with 3PMSF)
  - 7 All Season (include one all-terrain w/o 3PMSF)
  - 3 not identified

Testing Summary (continued)

- Speed Symbols (all tyres tested to Q conditions)
  - 2 tyres SS Q
  - 21 tyres SS R
  - 5 tyres SS S
  - 1 tyre SS T
- Load Index (Range of 'Single' Load Index values)
  - LI 102 – 110 - 10 tyres
  - LI 111 – 116 - 7 tyres
  - LI 120 – 125 - 12 tyres
- Load Range ("LR") (17 of 29 tyres are DOT marked; other have no LR marked)
  - LR C 1 tyre
  - LR D 3 tyres
  - LR E 13 tyres

LT/C HS Test Results

- Each manufacturer followed internal guidelines for test removal criteria
- Results analyzed by Steps Above Limit (SAL) Ratio
  - # SAL FMVSS ÷ # SAL Modified Reg 54
  - Ratio of 1.00 is equal severity; > 1.00 means Reg 54 is more severe
- Dispersion rates were typical of HS testing, but could be reduced with additional replicate testing
- Industry members opted for greater variety of tyre types, sizes, manufacturers instead of replicate testing of fewer SKUs.
- ***Results showed FMVSS 139 test and the modified Reg 54 test to be equal in severity, with overall average SAL of 0.99 to 1.01, depending on analysis method***

Harmonized LT/C High Speed Recommendation

- Previous industry recommendations acknowledged by CPs:
  - Tyres with SS >/= S: Existing ECE Reg 54 HS test
    - Final test speeds are based on the speed symbol of the tyre
    - 20° to 30°C ambient temperature
- Current industry recommendations for consideration by CPs:
  - Tyres with SS = R: test to 170 km/h (106 mph) at 38°C ambient temperature*
  - All tyres with SS </= Q: test to 160 km/h (99 mph) at 38°C ambient temperature*

Justification for Modified ECE Reg 54 for SS </= R

- Test severity is equivalent
- Test efficiency (duration – impacting test lab capacity) is significantly improved

** proposed 36.5 °C ± 1.5°C (TBC)*