Submitted by the expert from The Republic of Korea

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Proposal for defining pre-condition on the test of steering control effort with a failure

KATRI

The Republic of Korea

Korea Transportation Safety Authority
Korea Automobile Testing & Research Institute

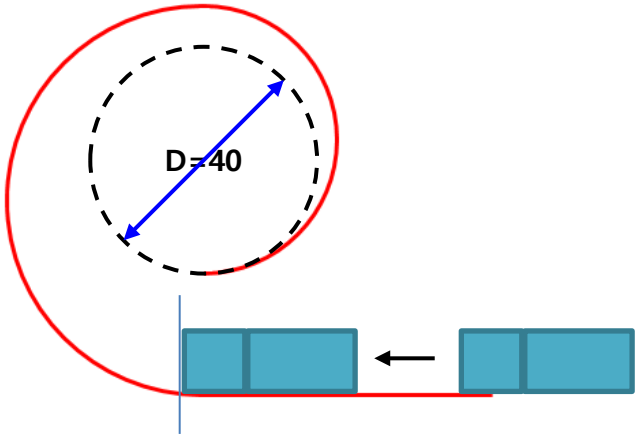
Test (Measurement) of steering control effort with a failure for heavy-duty(M_3/N_3)

- 5.3 Failure provisions and performance / 6.2.5 The measurement of steering efforts on motor vehicles with a failure in the steering equipment.

In the event of a failure in the steering system (energy supply device), measure the steering control effort while driving the vehicle straight at a speed of 10 kph and then maneuvering in a spiral until the outer front corner of the vehicle aligns with the corresponding turning radius.

※ There are no condition for pre-test preparation.

Steering control effort : The effort applied to the steering control device to maneuver the vehicle.
Steering control time : The time from the moment the steering device begins to move until it reaches the specified steering angle.
Target condition(For heavy-duty(M_3/N_3) : within 450 N (Steering effort) and 6 seconds (Steering time)



Test Results of Steering control effort with a failure

- Power Steering Oil's property of matter among Temperature / Viscosity / Friction
  Temperature ↑ → Viscosity ↓ → Friction ↓

Oil Temperature [℃]	Test Results [N]			
	Min	Max	Avg	Std.
3 ↓	428	**470**	**451.0**	13.4
3~8	405	**460**	427.1	12.1
8~13	387	431	409.2	10.7
13~15	386	418	400.7	8.5
20 ↑	391	425	410.1	8.7

* Test vehicle weight(GVW) : 16.5t (M_3)

Temperature of Test site (KATRI) in Korea

- The tests are normally conducted outside field, and the oil temperature of the steering system is affected by external temperatures.

- The temperature range in the test area in 2023 was from over -10 ~ 35 ℃

Thoughts of the failure condition

Failure condition in field

- While actual steering system failures may not be frequent, we think any occurrences would happen during operation.

- If a driver starts driving and immediately detects a steering system failure, they would likely not operate the vehicle

- **Therefore, considering situations occurring during operation, the oil temperature would likely be somewhat warmed up.**

Conclusion

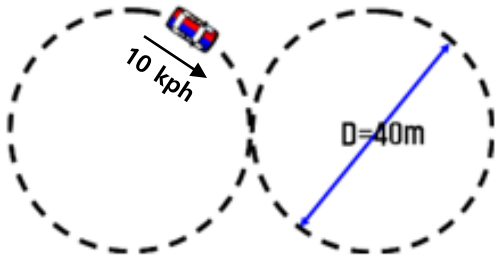
Proposal

- The aim is to implement test conditions that are as consistent as possible and to minimize differences in external factors between tests.

- To this end, we propose adding context regarding preconditions for allowable oil temperature warmed up, if requested or needed.

- Example Proposal

  [If requested by manufacturer, the vehicle can be performed at least 10 'figure of eight' manoeuvres in normal condition.]

	Test	Ambient Temperature	Oil Temperature
Vehicle_1	 "figure of eight" maneuvers 10 times	10	101
Vehicle_2		11	97
Vehicle_3		8	92
Vehicle_4		5	68

Thank you for your attention.

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