

## [Japan proposal for Road Test Surface condition on ESC test]

It is appropriate for the test method measuring Peak Friction Coefficient (PFC) by using standard tyre (ASTM1136:Tiger Paw as specified FMVSS138 to prescribe the road surface  $\mu$  at each proving ground of the Technical Service.

“K-value” is another test method for measuring surface friction, but this test method is not appropriate test method to compare each surface friction because of by using original equipped tyre of the vehicle.

“K-value” is appropriate only for using by the “ratio” such as “Utilization of Adhesion” of ABS testing ( $\varepsilon \geq 75\%$ ) specified in Annex 6 of R13H.

Theoretically, in the case of K-value measured with installed ASTM E1136 standard tyre, K-value is regarded as same as the PFC value specified SATM E1337-90 or ISO 8349.

We propose (A) for the first priority

Proposal (A)

Paragraph 6.2.2., amend to read

“6.2.2. The road test surface must produce a peak braking coefficient (PBC) of 0.9 when measured without water delivery using either:

- (a) the American Society for Testing and Materials (ASTM) E1136 standard reference test tyre, in accordance with ASTM Method E1337-90, at a speed of 40 mph; or
- (b) ~~the method specified in the Annex 6 Appendix 2 of UNECE Regulation No.13-H.~~  
**ISO 8349 Road vehicles – Measurement of road surface friction,  
 Section 6: Constant-speed, transient braking force method at a speed of 65 kph.**

Remark: ISO 8349 which is the same as ASTM method is appropriate standard as a reference for European contract parties.

If it is practically difficult to use the necessary trailer for each Technical Service, we propose The method of modified ASTM method using the specified actual vehicle equipped with the standard tyre Tiger Paw 195/75R14 will be appropriate.

We propose it as Proposal(B) .

Proposal (B)

“6.2.2. The road test surface must produce a peak braking coefficient (PBC) of 0.9 when measured without water delivery using either:

- (a) the American Society for Testing and Materials (ASTM) E1136 standard reference test tyre, in accordance with ASTM Method E1337-90, at a speed of 40 mph; or
- (b) [the method specified in the Annex 6 Appendix 2 of UNECE Regulation No.13-H.]  
**by using the specified actual vehicle equipped with the ASTM E1136 standard reference test tyre.**

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Remark: It is permitted to use the actual vehicle instead of the trailer.

The specified vehicle for only measuring PBC will be limited to install this small special tyre.

To prepare the situation that we can not agree the upper proposals, the following proposal is considered as a compromise.. it is the proposal (C)

We will do ESC test together with other brake test. Therefore in this proposal, the test surface condition is harmonized with the dry surface prescription of current R13H.

### Proposal (C)

“6.2.2. The road test surface must produce a peak braking coefficient (PBC) of 0.9 when measured without water delivery **or shall have a surface affording good adhesion.**”

### Remarks

= Attached reference =

1. Fig 1 shows the surface friction coefficient (PFC) of typical Japanese proving grounds for the type approval test by using ASTM test method.

The results shows PFC values are in-between  $\mu = 0.9$  to  $1.0$ .

Fig 2 shows the ratio of K-value to PFC value for passenger cars.

This figure shows the K-values are much different to the PFC value.

2. The slide 2 to 5 shows the results of the influence of surface friction to the lateral displacement by using simulation method.

Fig 3 shows the lateral acceleration generated by the first quarter sinusoidal steer input is increased by the higher surface friction, but at the same time, higher surface friction generate lager lateral acceleration of opposite side by next half sinusoidal reversal steer input.

As the result, the difference of lateral displacement is small by the cancellation of both side of lateral acceleration in the time period of double integral.

Fig 4 shows the surface friction affects lateral displacement about 15cm per  $\mu=0.1$  on average.

This influence is relatively small compared to the error range of driving test (about 22cm) shown in Fig 5.