

New proposal from Japan on Wind Tunnel measurement

Sep. 2017

Japan

Revision Proposal to Current Annex 4 Text

To clarify the Wind Tunnel Method...

3.3. General requirements for wind tunnel method

3.3.1. Measurement of aerodynamic drag shall be performed according to 6.1.2.2 of ISO 10521-1 or 2.3.1.2. of JIS D1012 2005*.

3.3.2. The road load value measured by wind tunnel method is recommended to calculate using the results of **2 or more wind speeds**** and 0 kph. The aerodynamic drag at 0 kph shall be equal to 0. In the case that the vehicle has movable aerodynamic body parts, paragraph 4.2.1.5. of this annex shall apply.

(*) These standards includes measurement instruction of aerodynamic drag

(**) See data on following pages

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6.2.3. Measurement with the wind tunnel method according to paragraphs 3.3. and 6.3. to 6.7. inclusive of this annex shall be performed on the same three vehicles as selected in paragraph 6.2.1. of this annex and in the same conditions, and the resulting road load coefficients, f_0 , f_1 and f_2 , shall be determined. The certification tests shall be performed with the procedure used at wind tunnel approval.

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6.4.2. The vehicle shall be in the condition described in paragraph 6.3. of this annex.
...
Aerodynamic drag shall be measured according to 3.3 of this Annex.
Aerodynamic drag shall be measured for at least for 60 seconds ...

Add new section in "General requirements" to Annex 4 in GTR 15, as 3.3.

3.3.1. Clarify the wind speed range according to ISO/JIS (at 80km/h and above)

3.3.2. **Recommendation** to calculate road load value with aerodynamic drag measured at 2 or more wind speed points and 0km/h (which is 0).

6.2.3.& 6.4.2. Clarify to follow a method written in a new section when obtaining the approval of facility (6.2.3.) and vehicle certification (6.4.2.)

- **General requirement of wind tunnel criteria**
 - At which wind speed point(s), should the facility comply with the criteria?
- **Recommendation of measuring C_d at several wind speed points**
 - If C_d might change depending on wind speed, shouldn't it be "requirement" instead of "recommendation"?
 - If C_d is measured at several wind speed points, how should we apply that to road load value? (By average? By a least squares regression?)
- **Measuring wind speed points of the facility approvals vs the vehicle approvals**
 - Should it be same?

- **General requirement of wind tunnel criteria**
 - The wind tunnel facility have to meet with the required criterion at wind speed points which are used on measuring C_d .

- **Wind speed points to measure Cd**

- (for both facility approvals and vehicle homologation)**

- **Require** to measure Cd at least 2 wind speed points, within the range of 80 km/h and above and, 150km/h and less.

One at or lower than 100 km/h. Another should be more than 40 km/h apart above the first speed point.

When measuring more than 2 points, intervals of wind speeds should be equal.

The type approval authority can request additional speed point(s).

(e.g. 2 points: 100 km/h and 140 km/h, 3 points: 80 km/h, 100 km/h, 120 km/h)

- Calculation of Road load: results of measured lowest/highest Cd differs
 - more than XX%: use a least squares regressions to calculate Cd at each reference speeds.
 - less than XX%: average all results and used for all reference speeds.
- XX% will be discussed later on.

- **Wind speed points used in facility approvals and vehicle homologation.**
 - As long as the facility meet with the required criterion at wind speed points which are used on measuring Cd, the points used in facility approvals and vehicle homologation can be different.
- **Measurement of $\Delta C_d A$**
 - Measure at one representative speed point between 80 km/h to 150 km/h.

Thank you for your attention!
