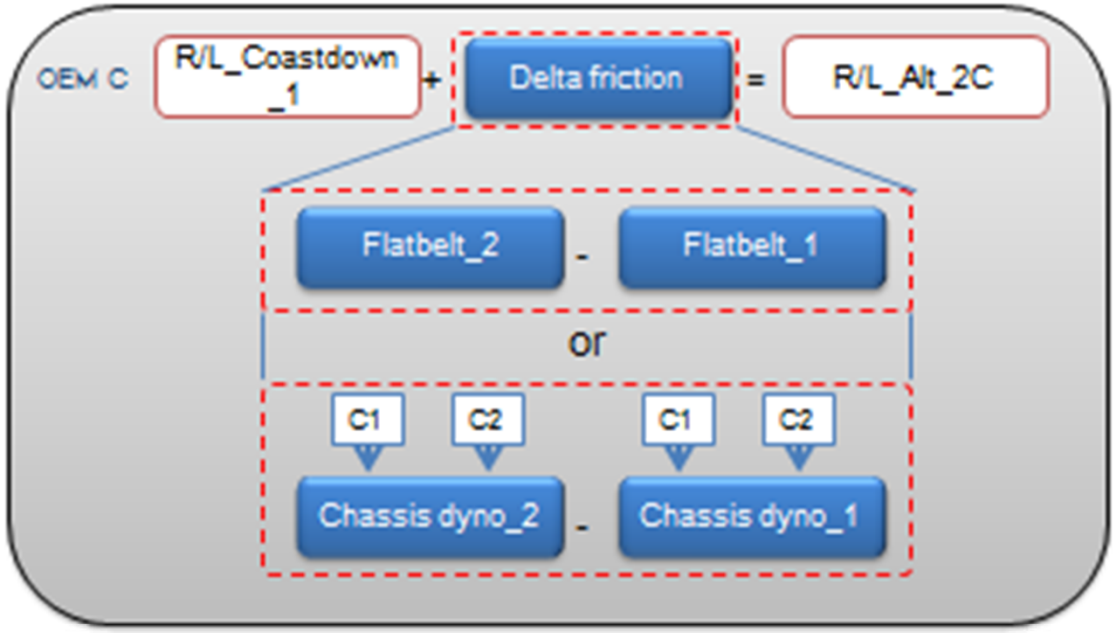
Alternative road load determination
- delta vehicle friction method -

September, 2016

JAPAN

Japanese proposal in Annex 4 TF at Brussels

Alternative road load determination



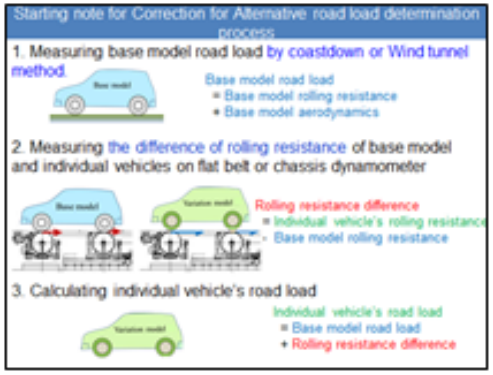
Need GTR description makes this possible.

BMW proposal in Annex 4 TF at Brussels

WLTP TYPE I TEST IMPROVEMENTS AND PROPOSALS
ROAD LOAD DETERMINATION, INCLUSION OF JAPANESE PROPOSAL IN CALCULATION SCHEME 1/2

Current situation	Proposal
Saving testing effort while at the same time increasing transparency Japan proposed the determination of a road load delta within the drivetrain, which was welcomed by the IWG. But this is currently not covered in the calculation formulas.	Clarify the description within the interpolation calculation to allow for a direct calculation of CO_2-values. These changes are explained on the following slide.

Justification:
The result or the scheme of the formula is not changed. The change should just clarify definitions in order to avoid misunderstandings and errors.



Example:

- Within a vehicle model, there might be two options for brakes: One standard one, and one sport brake, which will increase friction.
- Currently this would result in a separate road load family and two complete additional road load determinations.
- but practically the difference is e.g. 3N, which can be easily determined via a delta measurement on the one hand, and easily interpolated on the other hand.

GTR text Proposal (1/3)

Add the following paragraphs to Annex 4.

6.8 Application of the delta flat belt or chassis dynamometer results the flat belt and chassis dynamometer results

If road load difference which can not be handled directly by interpolation method described in paragraph 3.2.3.2. of Annex 7 (e.g. brake friction difference) , the delta road load may be measured by the flat bet or chassis dynamometer and used to determined the total road load according to the following paragraphs.

6.8.1. Determination of delta flat belt or chassis dynamometer

The delta road load coefficients shall be calculated by the following formula.

$$F_{Dj,Delta} = F_{Dj,N} - F_{Dj,R}$$

where:

$F_{DjDelta}$ is the delta road load at reference speed j of vehicle b, N;

F_{DjN} is the corrected resistance measured at the flat belt or chassis dynamometer at reference speed j calculated according to the paragraph 6.7.1. of this annex of the new vehicle, N;

F_{DjR} is the corrected resistance measured at the flat belt or chassis dynamometer at reference speed j calculated according to the paragraph 6.7.1. of this annex of the reference vehicle, N;

For all calculated $F_{Dj,Delta}$, the coefficients $f_{0,Delta}$, $f_{1,Delta}$ and $f_{2,Delta}$ in the road load equation shall be calculated with a least squares regression analysis.

GTR text Proposal (2/3)

6.8.2. Determination of total road load

If the interpolation method (see paragraph 3.2.3.2. of Annex 7) is not used, the total road load of the new vehicle shall be calculated according to the following formula.

$$f_{0,N} = f_{0,R} + f_{0,Delta}$$
$$f_{1,N} = f_{1,R} + f_{1,Delta}$$
$$f_{2,N} = f_{2,R} + f_{2,Delta}$$

where:

“N” refers to the road load coefficients of the new vehicle;

“R” refers to the road load coefficients of the reference vehicle;

“Delta” refers to the delta road load coefficients determined in paragraph 6.8.1. of this annex.

If the interpolation method is used, the calculation of total road load shall be performed within new road load family (see paragraph 4.2.1.3.6. of this annex and paragraph 3.2.3.2.2. of Annex 7).

GTR text Proposal (3/3)

In Annex 4, add a paragraph 4.2.1.3.6.:

4.2.1.3.6. If the delta road load caused by vehicle option is determined according to 6.8.1. of this annex, a new road load family is calculated such, that this road load delta is included in both, L and H, of that new road load family.

$$f_{0,N} = f_{0,R} + f_{0,Delta}$$
$$f_{1,N} = f_{1,R} + f_{1,Delta}$$
$$f_{2,N} = f_{2,R} + f_{2,Delta}$$

where:

“N” refers to the road load coefficients of the new road load family;

“R” refers to the road load coefficients of the reference road load family;

“Delta” refers to the delta road load coefficients determined in paragraph 6.8.1. of this annex.

In Annex 6, add a sentence at the end within 1.2.3.1.

Road load coefficients and test mass of test vehicle L and H may be taken from different road load families, as long as the difference between these road load families results from applying paragraph 6.8.1. of this annex, and the requirements in paragraph 1.2.3.2. are maintained.

Annex 7:

insert the text under:

3.2.3.2.2. Road load calculation for an individual vehicle

In the case, that the interpolation family is derived from one ore more road load families, the calculation of the individual road load shall be performed within the road load family, that is applicable to the individual vehicle.

delete "interpolation family" as this paragraph is valid for road load family as well:

3.2.3.2.2.4. Calculation of road load for individual vehicles ~~in the interpolation family~~

add a sentence at the end within 3.2.3.2.3.

These three sets of road loads may be derived from different road load families.