# Proposal by T&E on how to address vehicle-forced speed errors

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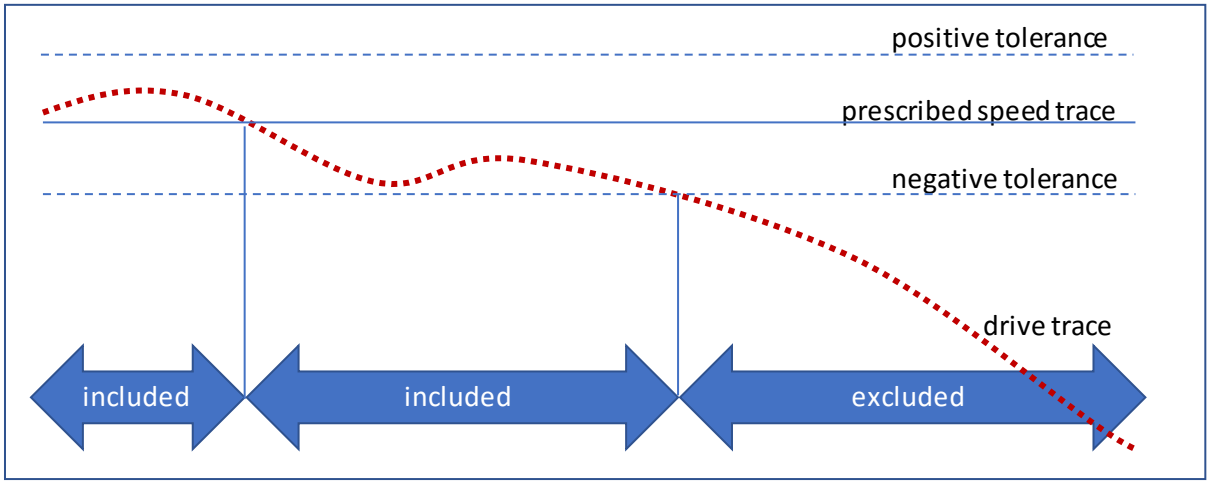
***Problem description***

What should be done for the calculation of the drive trace indices (DTI) if a deviation from the prescribed speed drive trace is not a driver-forced action, but a vehicle-forced action because the vehicle is not able to follow the cycle?

***Proposal:***

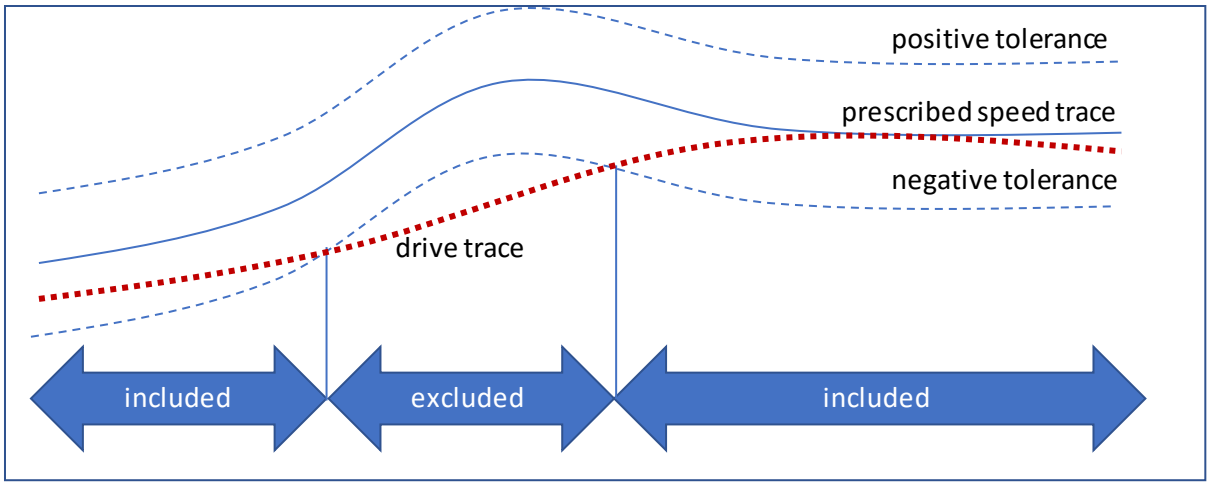
Vehicle-forced errors should not be included into the calculation of the DTI, only errors related to the driving behaviour of the test driver. As soon as the vehicle exceeds the drive trace tolerance to the negative side (lower speed), this is to be considered a vehicle-forced error and the remaining part of the test cycle is excluded from the DTI calculation. This is illustrated by the figure below, which shows the second constant speed segment in the shortened test procedure.




Note that the part which is below the prescribed speed trace, but still above the negative tolerance should be *included* in the DTI calculation.

For this case of the shortened test procedure, the driver is instructed to stop the vehicle so the drive trace will not re-enter within the allowed tolerance. It is proposed to make a requirement that the DTI calculation will be done up until the point where the drive trace falls below the lower tolerance (with reference to Annex 6, par. 2.6.8.3) just prior to reaching the break-off criterion (with reference to Annex 8, par. 3.4.4.2.3.).

The other possible scenario is for a vehicle that is not capable to accurately follow the prescribed cycle, e.g. because the nearly depleted REESS reduces the acceleration power. This is illustrated in the figure below .




Note that the part where the drive trace is re-entering the allowed speed tolerance should be *included* in the DTI calculation.

For this case the driver is instructed according to par. 2.6.8.3 of Annex 6 to fully activate the accelerator control during the time that the drive trace is below the negative tolerance. That will ensure that this period does not take more time than needed, and the speed deviation is strictly vehicle-forced. It is proposed to make a requirement that the DTI calculation will exclude the period where the drive trace falls below the negative tolerance (with reference to Annex 6, par. 2.6.8.3), up until the point where it again reaches the negative tolerance.

***Rationale***

The Drive Trace Indices (DTI) have clearly been introduced to recognize a driving behaviour during the test which is deviating beyond acceptable limits from the prescribed drive trace, either to the better or the worse end. This driving behaviour is an intentional action by the driver, to positively (or negatively) influence the result. In the case that the vehicle is no longer capable to follow the prescribed cycle (such as a PEV whose REESS is nearly depleted), the deviation is not a driver-forced intentional action, it is caused by a vehicle-forced unintentional action. Considering that the DTI should only address the intentional driving behaviour from the driver, these vehicle-forced deviation should be excluded from the calculation of the DTI.

The part which is below the prescribed speed trace, but still above the negative tolerance (middle section in the first figure) should be included in the DTI calculation because the test driver could anticipate that the REESS depletion is upcoming, and aim to drive in this region to positively influence the result.

For the case of the second figure, the part where the prescribed speed trace re-enters within the drive trace tolerance area should be included into the DTI calculation, because the test driver could take advantage of this by continuing to drive just below the speed trace.

***Relevant paragraphs for reference***

Annex 8, par. 3.4.4.2.3. specifies the break-off criterion as follows:

> The break-off criterion is reached when the vehicle exceeds the prescribed driving tolerance as specified in paragraph 2.6.8.3. of Annex 6 for 4 consecutive seconds or more in the second constant speed segment $CSS_E$. The accelerator control shall be deactivated. The vehicle shall be braked to a standstill within 60 seconds.

Annex 6, par. 2.6.8.3 specifies the speed trace tolerances

> Speed trace tolerances
>
> Vehicles that cannot attain the acceleration and maximum speed values required in the applicable WLTC shall be operated with the accelerator control fully activated until they once again reach the required speed trace. Speed trace violations under these circumstances shall not void a test. Deviations from the driving cycle shall be recorded.
>
> The tolerances shall not be shown to the driver:
>
> (a) Upper limit: 2.0 km/h higher than the highest point of the trace within ±1.0 second of the given point in time;
>
> (b) Lower limit: 2.0 km/h lower than the lowest point of the trace within ±1.0 second of the given time.
>
> See Figure A6/2.
>
> Speed tolerances greater than those prescribed shall be accepted provided the tolerances are never exceeded for more than 1 second on any one occasion.
>
> There shall be no more than ten such deviations per test cycle.

***Open issue***

For each DTI we should analyse if there is a need to normalise the DTI calculation if a part of the cycle is excluded or the cycle is aborted before the end because the break-off criterion was reached.