**R90 review by EC**

R90 provides uniform provisions concerning the approval of replacement brake lining assemblies, drum brake linings and discs and drums for power-driven vehicles and their trailers

Following points have been identified for discussion.

# Vehicle categories to be updated

* Add new vehicle categories X & Y in the main part of the regulation (cf. attached Excel file, column C)
* Category O (trailers) mentioned, but ADS doesn’t apply to them
* Category L (less than 4 wheels) mentioned:
  + SUGGESTION: We don’t consider ADS equipped L category vehicles (delivery pods) for the time being (to be confirmed).
* Annexes:
  + STATUS QUO: The requirements for the replacement of brake lining assemblies and brake discs/drums are outlined separately based on vehicle categories. For brake lining assemblies, the categories are divided into two groups: M1, M2, and N1 in one group, and M3, N2, and N3 in the other.
  + OPEN: Where should the requirements for replacement of break lining assemblies and brake discs/drums for vehicle categories X & Y be considered?
  + SUGGESTION:

Annex 3: Requirements for replacement brake lining assemblies for vehicles of categories M1, M2, N1, and M1X, M2X and N1X + N1Y?

Annex 4: Requirements for replacement brake lining assemblies and drum brake linings for vehicles of categories M3, N2, N3 and M3X, N2X + Y and N3X + Y?

Annex 11: Requirements for replacement brake discs or brake drums for vehicles of categories M, N (all sub-categories, including X and Y).

# Consideration of vehicles with low maximum speed

The speeds specified in the test procedures may not be applicable to certain types of vehicles, such as autonomous delivery vehicles or autonomous shuttles, **which have a maximum speed (Vmax) below 25 km/h and are incapable of driving faster**. Since these vehicles are designed for low-speed urban environments or pedestrian zones, it raises the question of how to adapt the testing requirements to evaluate their braking performance effectively within their speed range.

Example of where speeds are mentioned:

*Annex 3 Requirements for replacement brake lining assemblies for vehicles of categories M1, M2 and N1*

*1.1.2.2. Procedure*

*Perform a minimum 50 km driving distance and at least 100 brake applications at varying decelerations (at least between 1 m/s² and 5 m/s²) with initial speeds between 50 km/h and 120 km/h*

# Consideration of regenerative braking

The wording of the regulation and its annexes seems to accommodate ADS-equipped vehicles. For example, when "pedal effort" is referenced, it is accompanied by "line pressure," ensuring compatibility with a broader range of vehicles, including those without traditional pedals.

OPEN: However, it should be confirmed whether other braking systems, like **regenerative braking systems** used in electric vehicles (and thus in ADS vehicles), are integrated into the regulation since they do not rely on hydraulic line pressure as traditional braking systems do.

Example of section where “pedal” is mentioned:

*Annex 3 Requirements for replacement brake lining assemblies for vehicles of categories M1, M2 and N1*

*2.1.1.1 Make a minimum of six brake applications at spaced increments of* ***pedal effort or line pressure*** *up to wheel lock or, alternatively, up to a mean fully developed deceleration of 6 m/s2 or up to the allowed maximum pedal force for the category of vehicle in question from an initial speed as given in the table below: (…)*