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Automated/autonomous and connected vehicles:

Coordination of work on automation between working parties (GRs)

Fitness of UN GTRs and UN Regulations for ADS

Proposal for amendments to UN Regulation No. 79 (Steering equipment)

Submitted by the task force on regulatory fitness for Automated Driving System*

The text reproduced below was prepared by the experts from the Task Force (TF) on regulatory Fitness for Automated Driving System (FADS) introducing amendments to UN Regulation No. 79, enabling the type-approval of automated vehicles, including those without manual controls. It is based on ECE/TRANS/WP.29/GRVA/2025/23. The modifications to the current text of the Regulation are marked in bold or strikethrough characters. Items for which TF on FADS requires further discussion to reach consensus are marked between square brackets.

* In accordance with the programme of work of the Inland Transport Committee for 2025 as outlined in proposed programme budget for 2025 (A/79/6 (Sect. 20), table 20.6), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

I. Proposal

Introduction, amend to read:

"...unforeseen object in the road.

Advances in technology have enabled the possibility for vehicles to be operated by an Automated Driving System (ADS) without the need for any human driver. As an initial step, this Regulation ~~has been~~ **was** adapted to allow the approval of vehicles with an ADS where those vehicles are also equipped with manual driving controls. It is expected that in the manual driving mode the technical requirements can be applied as they would be for a conventional vehicle. In the automated driving mode, it is important that the requirements of Annex 6 are applied appropriately to the transmission links between the ADS and the steering equipment and, in the absence of a driver, that any faults in the steering equipment are identified by and/or transmitted to the ADS. It is also important that an ADS is only permitted to control the steering equipment if the ADS complies with the applicable regulatory requirements in the geographical area(s) where it can operate. In a second step, the Regulation ~~will be~~ **has been** further adapted to allow for the approval of automated vehicles which do not have manual steering controls, or which only have manual controls for use **at very low speeds in limited circumstances such as vehicle recovery**. **As a final step, it is expected to replace the reference to compliance with the applicable regulatory requirements in the geographical area(s) where the ADS can operate with a reference to a UN Regulation on the approval of vehicles with regard to their ADS.**

It was previously ..."

Paragraph 1.2.4., delete:

"1.2. This Regulation does not apply to:

...

~~1.2.4. Vehicles of categories M and N which are not equipped with manual steering controls intended for use during normal operation."~~

Paragraph 2.3., amend to read:

"2.3. "Steering equipment" means all the equipment the purpose of which is to determine the direction of movement of the vehicle.

The steering equipment consists of:

The steering control, **if any**,

The steering transmission,

The steered wheels,

The energy supply, if any."

Paragraph 2.3.2., amend to read:

"2.3.2. "Steering transmission" means all components which form a functional link between the steering control **and/or ADS (as applicable)**, and the road wheels.

The transmission is..."

Paragraph 2.3.4., amend to read:

"2.3.4. "Advanced Driver Assistance Steering System" means a system, additional to the main steering system, that provides assistance to ~~the~~ **a** driver in steering the vehicle but in which the driver remains at all times in primary control of the vehicle. It comprises one or both of the following functions:"

Paragraph 2.5.1.1.3., amend to read:

"2.5.1.1.3. "Full-power steering equipment" in which **the steering is controlled by a driver and** the steering forces are provided solely by one or more energy supplies;"

Insert new paragraph 2.5.1.1.4., to read:

"2.5.1.1.4. "ADS steering equipment" in which the steering is controlled by an ADS and the steering forces are provided solely by one or more energy supplies."

Paragraphs 2.15. and 2.16., amend to read:

"2.15. The *"effect of ageing"* is quantifying the irreversible degradation of the performance of an electrical storage device of a full power steering system **or ADS steering equipment**, due to e.g., the effects of time, use, and environmental exposure.

2.16. *"Energy Management System"* means, an electrical device(s), being part of, or used by, a full power steering system **or ADS steering equipment**, that monitors critical variables that impact on the performance and state of the electrical storage device(s) (e.g., voltage, temperature, internal resistance, effect of ageing, state of charge, power consumption, charging cycles, etc.) and deduces the actual capability of the devices to fulfil the performance requirements of this Regulation."

Insert new paragraph 3.2.4., to read:

"3.2.4. In the case of vehicles equipped with an ADS, an overview of the transmission links between the ADS and the steering equipment."

Paragraph 5.1.1., amend to read:

"5.1.1. The steering system shall ensure easy and safe handling of the vehicle up to its maximum design speed or in case of a trailer up to its technically permitted maximum speed. ~~There shall be a tendency to self-centre when tested in accordance with paragraph 6.2. with the intact steering equipment.~~ The vehicle shall meet the requirements of paragraph 6.2. in the case of motor vehicles and of paragraph 6.3. in the case of trailers. If a vehicle is fitted with an auxiliary steering system, it shall also meet the requirements of Annex 4. Trailers equipped with hydraulic steering transmissions shall comply also with Annex 5."

Insert new paragraphs 5.1.1.1. to 5.1.1.3., to read:

"5.1.1.1. Except in the case of vehicles of categories X and Y¹, there shall be a tendency to self-centre when tested in accordance with paragraph 6.2. with intact steering equipment.

5.1.1.2. The steering control of vehicles of categories X and Y, if fitted, and their associated transmission are only required to comply with this regulation insofar as:

5.1.1.2.1. The direction of operation of the steering control shall correspond to the intended change of direction of the vehicle.

5.1.1.2.2. Paragraphs 5.1.5. and 5.1.11. shall apply.

5.1.1.2.3. Paragraph 5.3.1.3. shall apply whilst the steering control is in use.

5.1.1.2.4. The steering control shall be located such that the driver is able to operate the vehicle safely (e.g. with an adequate view of the driving environment).

5.1.1.2.5. If the steering control is made by a remote-control device in close proximity to the vehicle, the requirements of paragraph 5.7. (with the exception of paragraph 5.7.1.13. and paragraphs 5.7.1.16. to 5.7.1.21.) shall apply.

5.1.1.3. It shall be ensured through technical means that the speed of vehicles of categories X and Y cannot exceed 6 km/h whilst the vehicle is being manually driven."

Paragraph 5.1.2., amend to read:

- "5.1.2. It shall be possible to travel along a straight section of road without unusual steering correction by the driver **or ADS**, and without unusual vibration in the steering system at the maximum design speed of the vehicle."

Paragraph 5.1.5., amend to read:

- "5.1.5. The effectiveness of the steering equipment, including the electrical control lines, shall not be adversely affected by magnetic or electric fields. This shall be demonstrated by fulfilling the technical requirements and respecting the transitional provisions of Regulation No. 10 by applying **the following series of amendments (or later), as applicable:**

- (a) The 03 series of amendments for vehicles without a coupling system for charging the Rechargeable Electric Energy Storage System (traction batteries);
- (b) The 04 series of amendments for vehicles with a coupling system for charging the Rechargeable Electric Energy Storage System (traction batteries);-
- (c) **The 07 series of amendments for vehicles equipped with an ADS."**

Paragraph 5.4., amend to read:

- "5.4. Warning signals
- The requirements of this section related to warning signals to the driver shall not apply whilst an ADS feature is active. Requirements of paragraph 5.8.3. shall apply instead."**

Insert new paragraph 5.5.3., to read:

- "5.5.3. **For vehicles of categories X and Y, suitable means shall be provided (e.g. a test mode, manual controls) to enable the performance of the necessary physical checks described in paragraph 5.5.1."**

Paragraph 5.7.1., amend to read:

- 5.7.1. Vehicles of category M₁ and N₁ meeting the requirements of Category G¹, **as well as vehicles of categories X and Y**, may be equipped with RCM provided the system fulfils the following requirements.

Paragraph 5.8., amend to read:

- "5.8. Special Provisions for vehicles equipped with an Automated Driving System
- The steering equipment of any vehicle equipped with an Automated Driving System, ~~other than Automated Lane Keeping Systems as defined in UN Regulation No. 157,~~ shall fulfil the following requirements."

Paragraph 5.8.3., amend to read:

- "5.8.3. Whilst ~~the an~~ **an ADS feature** is active, ~~detected faults warning signals (e.g. failure status) and other information intended for the driver~~ **as described in paragraph 5.4. of this UN Regulation shall be transmitted to the ADS.**
- The means by which it is ensured that existing detected faults are transmitted to the ADS before an ADS feature becomes active (e.g. previously detected faults which remain present) shall be documented by the manufacturer and demonstrated in accordance with Annex 6."**

Insert new paragraph 5.8.4., to read:

- "5.8.4. **Without prejudice to the requirements of other applicable regulations, the steering control and transmission links between the steering control and steering equipment may be disabled or disconnected whilst an ADS feature is active."**

Insert new paragraph 5.8.5., to read:

- "5.8.5. Notwithstanding the provisions of sections 5.1.6 and 5.6, Advanced Driver Assistance Steering Systems shall not be active, or be able to be activated, whilst an ADS feature is active."**

Insert new paragraphs 5.8.6. to 5.8.6.3., to read:

- "5.8.6. Whilst the vehicle is in a manual driving mode (if applicable), the steering system is classified according to paragraphs 2.5.1.1.1. to 2.5.1.1.3. and shall meet all requirements of this regulation relevant to that classification. Whilst an ADS Feature is active, the steering equipment is classified as ADS Steering Equipment according to paragraph 2.5.1.1.4. and shall meet all applicable requirements of this regulation, and the following additional requirements.**
- 5.8.6.1. ADS Steering Equipment with electrical energy transmission shall meet the following additional requirements:**
- 5.8.6.1.1. If any ADS Feature can operate at speeds above 10 km/h, there shall be an energy management system meeting the requirements of paragraph 5.3.3.6.7.**
- 5.8.6.1.1.1. A warning signal shall be transmitted to the ADS no later than when the effect of ageing on the electrical storage device(s) is such that its performance is not sufficient to fulfil the specifications defined by the manufacturer according to paragraph 5.8.6.3.**
- 5.8.6.1.1.2. The energy management system shall continuously transmit the state of the electrical storage device(s) to the ADS.**
- 5.8.6.2. ADS Steering Equipment with non-electrical energy transmission shall meet the following additional requirement:**
- 5.8.6.2.1. The level of stored energy in the energy reservoir(s) shall be continuously transmitted to the ADS.**
- 5.8.6.3. The manufacturer shall document and demonstrate according to Annex 6 how, in case of a failure of the energy supply (including the energy source, if any), energy transmission or control transmission, the system is able to fulfil the specifications defined by the manufacturer. These specifications shall be defined in terms of a sequence (or sequences) of manoeuvres which can be performed, considering all relevant effects which could negatively impact the performance of the steering system (e.g. temperature, ageing effects of the electrical storage devices). The requirements of paragraph 6 for an intact system shall be satisfied until the vehicle speed is below 10 km/h.**
- The performance shall be assessed by the Technical Service at the time of type approval."**

Paragraph 6.1.4., amend to read:

- "6.1.4. In the case of any systems that use electrical energy for part or all of the energy supply, all performance tests shall be carried out under conditions of actual or simulated electrical load of all essential systems or systems components which share the same energy supply. Essential systems shall comprise **at least the following, where fitted:** lighting systems, windscreen wipers, ~~engine~~ **powertrain** management systems, ~~and~~ **braking systems and automated driving systems.**"**

Paragraph 6.2., amend to read:

- "6.2. Provisions for motor vehicles**
- Paragraph 6.2.1. applies to all motor vehicles, both whilst being manually driven and whilst any ADS feature is active.**

Paragraphs 6.2.2. to 6.2.5. do not apply to vehicles of categories X and Y, nor to vehicles of other categories whilst an ADS feature is active.

Paragraphs 6.2.6. and 6.2.7. apply only whilst an ADS feature is active."

Insert new paragraphs 6.2.6. to 6.2.9., to read:

- "6.2.6.** The measurement of steering time of vehicles equipped with an ADS, with intact steering equipment, whilst the ADS is active.
- 6.2.6.1.** The vehicle shall be driven from straight ahead into a spiral at a speed of 10 km/h. The time shall be measured from the start of steering motion until the position of the steered wheels corresponds to a turning radius of 12 m. One steering movement shall be made to the right and one to the left.
- 6.2.6.2.** The maximum permitted steering time with intact steering equipment is 4 seconds.
- 6.2.7.** The measurement of steering time of vehicles equipped with an ADS, with a failure in the steering equipment, whilst the ADS is active.
- 6.2.7.1.** The test described in paragraph 6.2.6. shall be repeated with a failure in the steering equipment. The steering time shall be measured from the start of steering motion until the position of the steered wheels corresponds to the turning radius of 20 m.
- 6.2.7.2.** The maximum permitted steering time with a failure in the steering equipment is 4 s, except for Categories M₃ and N₃ where the maximum permitted steering time is 6 s.
- 6.2.8.** If the turning radii specified in paragraphs 6.2.6.1. or 6.2.7.1. are not attainable (because the steering angle available to the ADS is limited, or because full lock is reached first), the maximum attainable steering angle shall be used, and the maximum permitted steering time shall be adjusted according to the following formula.

$$\text{Maximum permitted steering time} = \frac{r}{\text{Attainable turning radius}} \times t$$

In the case of intact steering equipment:

r = 12 m (or the full lock turning radius for vehicles of categories M₃ and N₃ if 12 m radius is not attainable)

t = 4 s

In the case of a failure in the steering equipment:

r = 20 m

t = 6 s in the case of vehicles of Categories M₃ and N₃
4 s in all other cases

- 6.2.9.** The tests described in paragraphs 6.2.6. and 6.2.7. shall be conducted using a method subject to agreement between the manufacturer and the Technical Service, in order to demonstrate that the steering actuator(s) can achieve the specified steering times.

The manufacturer shall demonstrate that the test activation method accurately replicates ADS steering performance, and a detailed description of the method used shall be included in the test report. The steering demand made shall be recorded in the test report alongside the results of each test.

In the case that the vehicle has full power steering in the manual driving mode, the tests described in paragraphs 6.2.6. and 6.2.7. are not required to be performed if the manufacturer can demonstrate that the steering

performance available to the ADS is equivalent to that available in the manual mode."

Insert new paragraph 12.4. and subparagraphs, to read:

- "12.4. Transitional provisions applicable to the 05 series of amendments**
- 12.4.1. As from the official date of entry into force of the 05 series of amendments, no Contracting Party applying this Regulation shall refuse to grant or refuse to accept UN type approvals under this regulation as amended by the 05 series of amendments.**
- 12.4.2. As from 1 September [2027], Contracting Parties applying this Regulation shall not be obliged to accept UN type approvals to the preceding series of amendments, first issued after 1 September [2027].**
- 12.4.3. Until 1 September [2029], Contracting Parties applying this Regulation shall continue to accept UN type approvals to the preceding series of amendments to this Regulation, first issued before 1 September [2029].**
- 12.4.4. As from 1 September [2029], Contracting Parties applying this Regulation shall not be obliged to accept type approvals issued to the preceding series of amendments to this Regulation.**
- 12.4.5. Notwithstanding paragraphs 12.4.2. and 12.4.4., Contracting Parties applying this UN Regulation shall continue to accept UN type approvals issued according to any of the preceding series of amendments to this UN Regulation, for vehicles which are not affected by the provisions introduced with the 05 series of amendments, provided the transitional provisions in these respective previous series of amendments foresee this possibility.**
- 12.4.6. Until 1 September [2030], type approvals according to the 05 series of amendments to this UN Regulation may be granted to new vehicle types equipped with an Automated Lane Keeping System as defined in UN Regulation No. 157, for vehicles not complying with the requirements of paragraph 5.8. with respect to that Automated Lane Keeping System (ALKS).**
- 12.4.7. Contracting Parties applying this Regulation shall continue to accept UN type approvals for vehicle types equipped with an Automated Lane Keeping System as defined in UN Regulation No. 157, for vehicles not complying with the requirements of paragraph 5.8. with respect to that Automated Lane Keeping System (ALKS), first issued before 1 September [2030].**

Paragraphs 12.4. and 12.4.1. (former), renumber as paragraphs 12.5. and 12.5.1.

Footnote 1, amend to read:

As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.), document ECE/TRANS/WP.29/78/Rev.68, para.2
<https://unece.org/transport/standards/transport/vehicleregulations-wp29/resolutions>

Annex 1, insert new paragraphs 5.6.1. to 5.6.3., to read:

- "5.6. Vehicle is equipped with an ADS: yes/no**
- 5.6.1. If applicable, description of the disconnection or disablement of the steering control while an ADS feature is active:**
- 5.6.2. For vehicles of categories X and Y, description of the operation of the manual steering control, if fitted:**
- 5.6.3. Description of the specifications defined by the manufacturer according to paragraph 5.8.6.3. (i.e. the sequence(s) of manoeuvres that can be performed under failure conditions):"**

Annex 3, insert new paragraph 1.4., to read:

"1.4. For vehicles of categories X and Y, tests shall be conducted using a method subject to agreement between the manufacturer and the Technical Service, ensuring that the evaluation accurately reflects real-world ADS braking performance.

Wherever this annex details a control being actuated or a force being applied, that shall be understood as a braking demand being made. The manufacturer shall demonstrate that the test activation method accurately replicates ADS braking performance, and a detailed description of the method used shall be included in the test report. The braking demand made shall be recorded in the test report alongside the results of each test.

For vehicles equipped with an ADS, other than those of categories X and Y, the tests in this annex shall be performed at least using the relevant manual brake control. Tests need not be performed in ADS mode, providing that the manufacturer can demonstrate to the Technical Service that the same brake performance can be achieved when equivalent braking demands are made by the ADS. However, testing to verify this shall be performed at the discretion of the Technical Service."

Annex 4, paragraph 2.3.1., amend to read:

"2.3.1. Except for parts of ASE not considered susceptible to breakdown as specified in paragraph 5.3.1.1. of this Regulation, the following failure of ASE shall be clearly brought to the attention of the driver or transmitted to the ADS, as applicable:"

Annex 7, paragraph 2.1.2., amend to read:

"2.1.2. The ~~driver's~~ user manual shall include information to advise the ~~driver~~ user on the electrical energy available for the trailer steering system and that the electrical interface shall not be connected when the current requirement marked on the trailer exceeds that which can be supplied by the towing vehicle."

Annex 7, paragraph 3.5., amend to read:

"3.5. Failure warning:
Failures within the electric control transmission of the steering system shall be directly displayed to the driver or transmitted to the ADS, as applicable. "

II. Justification

A. Items proposed for amendment

(a) Introduction

1. The introduction is amended to reflect the completion of the second phase of the work of the TF on FADS and acknowledges that a further update might be needed once the UN Regulation on Automated Driving System (ADS) has been published.

(b) Paragraph 1.2.4.

2. The amendment introduced into the scope when UN Regulation No. 79 was previously amended to cover ADS vehicle with full manual driving capability is no longer needed, as this proposal expands the scope to include ADS vehicles both with and without manual driving capability.

(c) Paragraph 2.3.

3. Definition of steering equipment is amended to clarify that not all vehicles will have a ‘steering control’.

(d) Paragraph 2.3.2.

4. Definition of steering transmission amended to account for ADS vehicles potentially not having a steering control.

(e) Paragraph 2.3.4.

5. Definition of ADASS amended from ‘the driver’ to ‘a driver’ to clarify that a driver is not necessarily present. Subsequent uses of ‘the driver’ do not need amending.

(f) Paragraph 3.2.4.

6. A documentation requirement is added to ensure that the links between the ADS and steering system are adequately described by the manufacturer.

(g) Paragraphs 5.1.1. to 5.1.1.1.

7. Self-centring requirement removed from this paragraph, and re-inserted as new paragraph 5.1.1.1. which does not apply to vehicles of categories X and Y.

(h) Paragraph 5.1.1.2. to 5.1.1.3. and paragraph 5.7.1.

8. Allowance for steering controls in vehicles of categories X and Y (i.e. controls that can only be used below 6 km/h) to be exempted from the majority of requirements of R79 (e.g. those related to steering effort and safe handling), since these requirements are not justified when operating at such low speeds. Requirements that do apply to these controls are:

- The direction of control operation shall match the direction of the vehicle movement, part of paragraph 5.1.3. for conventional vehicles.
- Electromagnetic compatibility – paragraph 5.1.5.
- Safety aspects of electronic control systems – paragraph 5.1.11. (and by reference Annex 6).
- Fault / failure warnings to the driver – paragraph 5.3.1.3. (and by reference paragraph 5.4).
- The vehicle should be prevented from exceeding 6 km/h whilst such controls are in use.
- It is expected that category X and Y vehicles will be exempted from certain GRSG requirements related to the driver’s view of the road (e.g. R46, R125, parts of R43), however the GRSG Task Force on Automated Vehicle Regulatory Screening does not wish to leave these items completely unregulated. It is therefore appropriate to include in the steering regulation a basic requirement on where the steering control should be located, so that no specific vision requirements are needed in other regulations and the number of approvals required for such vehicles is reduced. It should be noted that requirements already exist in R79 to ensure the driver can be correctly located for RCP and RCM functions.
- It is expected that the manual control fitted to some category X and Y vehicles will be a remote control operated from outside the vehicle. R79 already has comprehensive requirements for such controls, currently only permitted for M1G and N1G category vehicles, and it is appropriate to apply the relevant aspects of these requirements to vehicles of categories X and Y. However, certain RCM requirements are not deemed relevant for category X and Y vehicles and so have been excluded (restriction to off-road use, requirement for number of drive axles, and the maximum distance that can be travelled). It will be necessary to use the manual driving function on-road, and for

X and Y vehicles there is no other option to move the vehicle when the ADS cannot function, so in some situations it might be reasonable to move the vehicle further than 100m; introducing delays in this operation is not seen to have a benefit.

9. It is acknowledged by TF on FADS that the speed restriction is not specifically a steering requirement, however the relaxations to the steering requirements given for vehicles of categories X and Y are on the basis that the vehicle can only be driven at low speeds, and so to ensure safety it is appropriate to have a requirement to ensure this is the case. UN Regulation No. R79 already has such speed restrictions for Automatically Commanded Steering Functions of Category A (ACSF-A) and Remote-Control Manoeuvring.

(i) Paragraph 5.1.2.

10. Adding ADS here to ensure that ‘unusual steering correction’ is also not required of an ADS. This requirement is not intended to prevent the ADS making continuous micro-corrections to the steering angle - this should be deemed normal behaviour of a closed-loop control system. Rather, it is intended to ensure that there are not fundamental deficiencies in the steering (for example excessive play in joints, or excessive latency in transmission of control signals) that require the driver or ADS to make corrections.

(j) Paragraph 5.1.5.

11. Update the reference to R10 because the new 07 series specifically covers ADS vehicles.

(k) Paragraph 5.4.

12. Clarify that warning signals do not need to be given whilst an ADS feature is active.

(l) Paragraph 5.5.3.

13. Provisions to ensure vehicles have facilities to enable PTI checks to be carried out (for example, a means of turning the steering in each direction to inspect components for wear).

(m) Paragraph 5.8.

14. In the first phase of the work of TF on FADS, which resulted in Supplement 11 to the 03 series and Supplement 6 to the 04 series of UN Regulation No. 79, ALKS vehicles were omitted from the ‘special requirements for vehicles equipped with an ADS’ in order to be sure that the amendments to UN Regulation No. 79 would not impact existing vehicles. It was acknowledged that the necessity of this exclusion should be kept under review, and the Task Force has not been able to identify any provision within paragraph 5.8 that ALKS vehicles should not already have to meet according to the requirements of UN Regulation No. 157. Therefore, it is proposed to remove this reference and treat ALKS vehicles like any other ADS vehicles, rather than as a ‘special case’.

(n) Paragraph 5.8.3.

15. Clarification on how to handle detected faults / failures while an ADS feature is active (i.e. when the ADS is performing the Dynamic Driving Task (DDT)). The situation should be transmitted to the ADS, and the ADS is expected to manage this information in accordance with the safety / operation concept and the requirements of the UN Regulation on ADS. It is also necessary to ensure the ADS is made aware of any pre-existing faults before it allows any feature to become active.

(o) Paragraph 5.8.4.

16. It is necessary to clarify that the manual steering controls are not required to operate the steering when an ADS feature is active. It is expected that this will be regulated within the Human Machine Interface (HMI) provisions of the UN Regulation on ADS, so a permissive provision is sufficient here.

(p) Paragraph 5.8.5.

17. Advanced Driver Assistance Steering Systems as defined in paragraph 2.3.4 are systems that ‘provide assistance to the driver’. This includes the functions ACSF-A to -E, Corrective Steering Function, Emergency Steering Function, Remote Control Manoeuvring and Risk Mitigation Function. The ADS is not a ‘driver’, and should not require such assistance, therefore it is appropriate to prohibit the activation of such systems while an ADS is active in order to avoid ambiguous states of control. The ADS may provide functionalities similar to these functions (e.g. lane-keeping, lane changing, minimum risk manoeuvres), however these are functions of the ADS itself to be regulated and assessed accordingly.

(q) Paragraphs 2.5.1.1.3., 2.5.1.1.4., 2.15., 2.16. and 5.8.6.

18. While under ADS control, vehicles must have sufficient redundancy and energy reserves to bring the vehicle to a Mitigated Risk Condition (MRC), in accordance with ADS requirements and as detailed in the manufacturer’s safety case. Although ADS features of Type 1 can attempt to transition control back to the fallback user as part of the failure strategy, they must still be able to reach an MRC if the fallback user does not respond. Therefore, it is appropriate to apply the same failure provisions to all ADS. When an ADS is performing the DDT, there is no muscular energy available from a driver. Therefore, steering equipment under the control of an ADS is similar to ‘Full Power Steering’ (FPS) as regulated in UN Regulation No. 79. However, FPS requirements have been drafted to allow the necessary time and performance for a human driver to react to the situation and respond accordingly, under any reasonably foreseeable road, environment, and traffic conditions. ADS vehicles have a defined ODD (which may restrict, for example, the types of roads that can be used and the maximum vehicle speed), and ADS can also be relied upon to respond to failures immediately. Therefore, it is appropriate to allow different requirements for steering controlled by an ADS. This proposal defines a new class of ‘ADS Steering Equipment’ and requires that the energy reserve and redundancy are demonstrated to be sufficient to fulfill the specifications defined by the manufacturer. If the ADS safety concept is known at the time of approval under UN Regulation No. 79, then that information can be used to define the specifications for assessment. If the ADS safety concept is not known at the time of approval under UN Regulation No. 79, the manufacturer can define one or more sequences of maneuvers that will be assessed. At the time the vehicle is approved regarding its ADS, the manufacturer is expected to demonstrate that the performance provided by the steering system, and assessed under UN Regulation No. 79, is sufficient to fulfil the needs of the ADS safety concept. In vehicles that can be both driven manually and controlled by an ADS, the relevant requirements of this regulation apply while the respective mode is active, and both modes will be assessed by the technical service. In ADS mode, the steering equipment must meet all applicable general requirements of the regulation, in addition to the specific requirements for ADS steering.

(r) Paragraph 6.1.4.

19. Update the list of ‘essential system’ that draw energy to include the ADS. Paragraph further amended for clarity.

(s) Paragraphs 6.2. and 6.2.6. to 6.2.9.

20. Conventional vehicles are required to be designed in a way that a human driver can turn the steering wheel to a given position within 4 seconds and with a maximum force. It is appropriate to require a vehicle being controlled by an ADS to achieve the same performance (i.e. be able to achieve the respective turning radius within the same time limits). This also ensures we have a benchmark for ‘intact performance’ and ‘failure performance’ when assessing full power steering requirements. The maximum force requirement is omitted whilst under ADS control. It is necessary to allow a reduced maximum turning radius where the ADS is limited in its ability to request steering angle due to its Operational Design Domain (ODD) e.g. for a highway-only system. It is also necessary to allow this performance to be demonstrated in any appropriate way, for example by making steering demands using special controls, during the manual steering tests if the vehicle has full power steering, using

a test mode of the ADS, or using results obtained during the testing of the ADS itself which show the required performance.

21. The formula provided ensures that if the steering angle is limited (i.e. the minimum turning radius is greater than the 12 / 20 m specified) then the allowed steering time is reduced in inverse proportion. Where M3 or N3 vehicles cannot achieve a 12m turning radius, the regulation allows the full 4s to achieve their full lock turning radius. Thus, for these vehicles, the maximum permitted intact steering time is adjusted compared to their 'full lock steering time', rather than their '12 m radius steering time', to ensure the requirements remain fair to such vehicles.

(t) Paragraph 12.4.

22. Vehicles which are not equipped with an ADS are not affected by these amendments, and so can be approved according to previous series of amendments.

23. Category X and Y vehicles (those which cannot be driven manually under normal circumstances) were not previously permitted to be approved to UN Regulation No. 79, and therefore must be approved to this new 05 series.

24. So-called 'dual mode' vehicles (i.e. those equipped with both a Type 2 ADS feature and a manual driving mode) are affected by these amendments, and so are given transitional dates as given in paras. 12.4.2 to 12.4.4.

25. Vehicles with ALKS are affected by these amendments, which are substantially different from those which were in place when UN Regulation No. 157 was adopted, and so approvals for such vehicles are permitted until 2030 with compliance with the new 'special provisions for vehicles equipped with an ADS' in paragraph 5.8.

(u) Annex 1

26. Communication form amended to include details of any steering controls that can be disabled, and any manual controls fitted to vehicles of categories X and Y.

(v) Annex 3

27. Brake testing provisions for systems with shared energy supply amended using adapted text from the testing section in the TF on FADS amendments to UN Regulation No. 13.

(w) Annex 4 paragraph 2.3.1. and Annex 7 paragraph 3.5.

28. Addresses fault transmission to ADS, as relevant.

(x) Annex 7 paragraph 2.1.2.

29. Replace "driver's manual" with "user manual", as the person who needs this information might not be a driver in the case of an ADS vehicle.

B. Items discussed by TF on FADS but not proposed for amendment

(a) Paragraph 2.2. (type definition)

30. The TF on FADS agreed that the Type definition does not need to change, because 'steering control' is already included as an aspect within the type definition.

(b) Paragraphs 2.5.3.1. and 2.5.3.2. (front- / rear-wheel steering equipment)

31. The TF on FADS agreed, in consultation with other screening task forces and the mandate from WP.29, that bi-directional vehicles would be covered in a future phase of amendments.

(c) Paragraph 5.1.6. (Advanced Driver Assistance Systems)

32. TF-FADS agreed that no changes are needed to UN Regulation No. 79, because the state of Advanced Driver Assistance Systems (ADAS) relating to transitions of control is expected to be covered by the UN Regulation on ADS. See working paper ADS-04-15, paragraph 5.3.2.3.8.

(d) Annexes 9 and 10 (Communication with trailers for ACSF functions)

33. Since these annexes specifically relates to ACSF, they are deemed not applicable for ADS. If an ADS can operate with the vehicle in combination, it will be important that any communication with the trailer is assured. However, this should be addressed by requirements for the ADS.
