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## Economic Commission for Europe

Inland Transport Committee

World Forum for Harmonization of Vehicle Regulations

Working Party on General Safety Provisions

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Item 13 of the provisional agenda

**Consolidated Resolution on the Construction of Vehicles**

### **Proposal for Amendments to Consolidated Resolution on the Construction of Vehicles (R.E.3)**

**Submitted by the expert from International Body and Trailer Building Industry (CLCCR) \***

The text reproduced below was prepared tabled by the expert from International Body and Trailer Building Industry (CLCCR) to amend Consolidated Resolution on the Construction of Vehicles (R.E.3). It is based on informal document GRSG-122-30 distributed at the 122nd session of the Working Party on General Safety Provisions (GRSG). The modifications to the current text of the R.E.3. are marked in bold for new and strikethrough for deleted characters.

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\* In accordance with the programme of work of the Inland Transport Committee for 2022 as outlined in proposed programme budget for 2022 (A/76/6 (part V, sect. 20) para. 20.76), 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

*Paragraph 1.5.*, amend to read:

- "1.5. "Trailer" means any non-self propelled vehicle, which is designed and constructed to be towed by a power driven vehicle and includes semi-trailers. **However, the trailer may be propelled to support the trailer's motion but shall not apply motive power without being coupled to a towing vehicle.**"

*Paragraph 1.8.*, amend to read:

- "1.8. "Road tractor" means a road motor vehicle designed, exclusively or primarily, to haul other road vehicles ~~which are not power driven~~ (mainly semi-trailers)."

*Paragraphs 2.4.5.1. to 2.4.5.3.*, amend to read:

- "2.4.5.1. "Semi-trailer": A ~~towed~~ **towable** vehicle, in which the axle(s) is (are) positioned behind the centre of gravity of the vehicle (when uniformly loaded), and which is equipped with a connecting device permitting horizontal and vertical forces to be transmitted to ~~the~~ a towing vehicle. One or more of the axles may be driven **to support** ~~by~~ the towing vehicle. **A contribution to the propelling forces of the vehicle combination is permitted at all speeds. To ensure the stability of the vehicle combination, the propelling forces of the semi-trailer shall not push the towing vehicle in longitudinal direction at speeds above [15 km/h].**
- 2.4.5.2. "Full trailer": A ~~towed~~ **towable** vehicle having at least two axles, and equipped with a towing device which can move vertically (in relation to the trailer) and controls the direction of the front axle(s), but which transmits no significant static load to the towing vehicle. One or more of the axles may be driven **to support** ~~by~~ the towing vehicle. **A contribution to the propelling forces of the vehicle combination is permitted at all speeds. To ensure the stability of the vehicle combination, the propelling forces of the full trailer shall not push the towing vehicle in longitudinal at speeds above [15 km/h].**
- 2.4.5.3. "Centre-axle trailer": A ~~towed~~ **towable** vehicle, equipped with a towing device which cannot move vertically (in relation to the trailer) and in which the axle(s) is (are) positioned close to the centre of gravity of the vehicle (when uniformly loaded) such that only a small static vertical load, not exceeding 10 per cent of that corresponding to the maximum mass of the trailer or a load of 1,000 daN (whichever is the lesser) is transmitted to the towing vehicle. One or more of the axles may be driven **to support** ~~by~~ the towing vehicle. **A contribution to the propelling forces of the vehicle combination is permitted at all speeds. To ensure the stability of the vehicle combination, the propelling forces of the centre-axle trailer shall not push the towing vehicle in longitudinal direction at speeds above [15 km/h]."**

## II. Justification

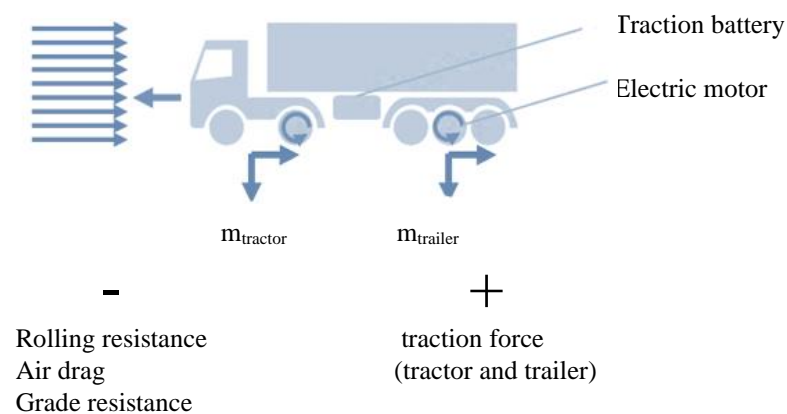
1. To tackle climate change, it is needed to significantly reduce CO<sub>2</sub> emissions induced by the transport sector worldwide. The transport sector is an important CO<sub>2</sub> emitter after the energy sector and other industry branches. Therefore, stringent goals for heavy duty vehicles are defined to limit the CO<sub>2</sub> emissions. These ambitious goals will have a major influence on future design of trucks and trailers on roads and it will significantly change the type of propulsion for such vehicle combinations. E.g. the European directive (EU) 2019/1242 describes the provisions to reduce CO<sub>2</sub> emissions for heavy duty vehicles. Despite of the fact that trailers or semi-trailers are currently not regulated (The European Commission is working on a draft regulation to implement trailers into CO<sub>2</sub> certification process. The final regulation is to be provided soon.) it might be interesting for a closer look on their potential to contribute to the overall CO<sub>2</sub> reduction of a vehicle combination. The trailer or semitrailer itself does not emit CO<sub>2</sub> in standstill or driving modes but contribute to the overall CO<sub>2</sub> balance of the vehicle combination. CO<sub>2</sub> values may be assigned to the trailer due to its rolling resistance, its kerb

weight and finally the air drag. Therefore, it is logically to think about measures/technologies for a reduction of these emissions. Based on this development trailer manufacturers are urged to contribute to CO<sub>2</sub> reduction by improved trailer design and new technologies now.

2. One of these features is a driven axle in a trailer/semi-trailer (e.g. with propulsion and/or recuperation system). Driven axles in trailers have the potential to support the motor vehicle (e.g. the tractor) during start-stop manoeuvres, during accelerating/braking and during transport of heavy loads under ambitious conditions (uphill/downhill) or may convert the kinetic energy of an axle to supply electric systems (e.g. cooling units for reefer). This leads to lower fuel consumption of the motor vehicle respectively cooling units (ergo lower CO<sub>2</sub> emissions) and higher agility of the whole vehicle combination.

Figure 1

**Principle/Example of Driven Trailer Axles**



The type of drivetrain may currently be electrical, or hydraulic. The drive train on the trailer/semi-trailer will be controlled to safely follow the towing vehicle. The propelling capacity of any trailer/semi-trailer in a vehicle combination shall be controlled within the vehicle combination in such a way that the longitudinal/lateral stability of the combination is not negatively influenced. The drive train of the trailer/semi-trailer can operate in the full speed range of the vehicle combination and is not limited to low-speed applications. But the pushing of the towing vehicle by the trailer/semi-trailer is not permitted at speeds higher than 15 km/h. The trailer shall always remain in the towed condition with tensile forces in the coupling (except for the starting aid and except pushing forces that result from the normal dynamic conditions of the motor vehicle and trailer while driving/braking as it is usual today). Heavy trailers (category O<sub>3</sub> and O<sub>4</sub>) are predestined to be propelled by an electric or hydraulic engine to reduce the overall CO<sub>2</sub> emission of the tractor/lorry. But also propelled light trailers (category O<sub>2</sub>) have a huge effect on vehicle dynamics. The use of a trailer (e.g. caravan) is mostly not foreseen in combination with battery electric cars or results in a huge reduction of the range due to the limited battery capacity of a car. This may lead to low acceptance of battery electric cars in a growing market of caravan users. But especially an electric propulsion in a trailer of category O<sub>2</sub> (e.g. caravan) would allow the use of this trailer in a combination with a battery electric vehicle. The e-trailer would be able to guarantee the normal range of the battery electric car in combination with the trailer without any further emissions.

3. The principles of a trailer/semi-trailer for road transport are defined in several regulations. The main definition of a trailer/semi-trailer describes very often the status to be a "towed vehicle" and in some cases to be "non-self-propelled". The current definition might lead to misunderstandings in the case that one or more trailer axles may be driven by a type of propulsion integrated into the trailer (e.g. electric engine) in combination with the motor

vehicle. A clarification of some definitions in the UN regulatory framework would be helpful to avoid different interpretations of type approval authorities worldwide.

Paragraph 1.5.:

"However, the trailer may be propelled to support the trailer's motion but shall not apply motive power without being coupled to a towing vehicle." – The trailer shall always be a part of the vehicle combination and shall not be used as a self-driving vehicle. Nevertheless, a trailer/semi-trailer may be a propelled vehicle as long as the trailer/semi-trailer is designed to be a towed vehicle under normal driving conditions and propelling forces of the trailer contribute to the overall propelling forces of the towing vehicle during motion. The application of forces to the motion of the trailer depends on the coupling status.

*Paragraphs 2.4.5.1. to 2.4.5.3.:*

"A contribution to the propelling forces of the vehicle combination is permitted at all speeds. To ensure the stability of the vehicle combination, the propelling forces of the semi-trailer shall not push the towing vehicle in longitudinal direction at speeds above [15 km/h]." – A type of propulsion in the trailer maybe active over the full range of speed for this vehicle combination as long as the stability is not negatively affected. Furthermore, the trailer may push the towing vehicle in low-speed manoeuvres up to 15 km/h, e.g. support of stop-start manoeuvres.

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Remark:

Paragraph 1.5.: "...constructed to be towed by a power driven vehicle" – The wording "*power driven*" is not correct for vehicle combinations with more than one trailer, e.g. modular vehicle combinations. This wording maybe deleted.

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