

Economic Commission for Europe

Inland Transport Committee

Working Party on the Transport of Dangerous Goods

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Item 5 (a) of the provisional agenda

**Proposals for amendments to annexes A and B of ADR:
construction and approval of vehicles**

Report of the informal working group on Electrified Vehicles

Transmitted by the Government of the Netherlands on behalf of the informal working group

Introduction

1. The informal working group on Electrified Vehicles (IWG-EV) and its sub-groups met on several occasions between the May 2022 and November 2022 sessions of WP.15. In these sessions a total 95 persons were on the mailing list attending in several configurations in several groups. All but one meetings were virtual.
2. It proved not possible to forward concrete proposals as planned for the 112th session of WP.15. The summer holiday limited meeting opportunities and participation along with the complex nature of the subject.

Discussion

3. It was felt that UN Regulation No. 100, Battery Electric Vehicles (R.100) for FL vehicles and UN Regulation No. 134, Hydrogen Fuelled Vehicles, were not sufficiently detailed to cover all the minimum safety requirements for Heavy Duty Vehicles carrying dangerous goods.
4. Introducing detailed requirements to cover these details in ADR was considered not appropriate as this should be done in the said vehicle regulations. Instead, it was suggested to include generic descriptions.
5. In case these generic descriptions would be too ambiguous, leading to interpretation issues between manufactures, technical services and authorities, the option of a Guidance document was considered to be placed on the UNECE website. The WP.15 is requested to approve this way of working. WP.15 may consider a request to WP.29 to update the regulations.
6. Although the contents are still under consideration, for a number of topics potential examples are given below:

Examples

9.2.4.w *To make the vehicle safe in an area where an explosive atmosphere may occur [while handling the load] a control device shall be placed in the driver's cab, within easy reach in his seat, that will de-energize the [low and/or high] voltage system outside the protective housing of the REESS [and low voltage battery box].*

9.2.4.x *The electric power drive system shall be so constructed that any excess heat shall not constitute a hazard to the load by raising the temperature on the inner surface of the load compartment above [80 °C]. Compliance with these requirements shall be verified on the completed vehicle.*

Considerations on the examples above

9.2.4.w

7. The purpose of the Battery Master Switch was point of discussion. It was explained that the purpose is to make a vehicle safe in the case an explosive atmosphere would be available. This was explained to be during filling or discharging the load compartment. It was stressed that this would not be an emergency switch that should be operated during driving.

8. When the insulation of high voltage systems is controlled by a monitoring system, preventing sparks and development of heat by break down of insulation, it was discussed if a battery master switch (or function) would still be necessary. Although the study by the user group is not yet completed there is a tendency that this would still be necessary.

9. It was said that a physical switch in the high voltage system would lead to damage to contacts if a current is still running while breaking the contacts. In most cases electronics would de-energize the cables coming out of the REESS. For this reason, the description is about a system rather than a physical switch.

10. For the generation of BEV coming on the market in foreseeable future a low voltage DC system will be present to power lights, screen wipers, radio's, camera's etc. This low voltage system needs to comply to the current requirements for a battery master switch. In some designs the high and low voltage systems are coupled, switching of the low voltage system also switches of the high voltage system.

11. It was said that 10 seconds were insufficient to switch off the high voltage system. However, 30 seconds was felt to be acceptable.

12. De-energizing the high voltage system, outside the REESS, may lead to a number of questions that require further discussion.

* Shall the battery management system (BMS) remain active?

* Shall the cooling system remain active to dissipate remaining heat developed by discharging?

If they remain active shall they be approved for the use in an explosive atmosphere (IEC standards)?

9.2.4.x

13. Heat and ignition of the load is a main concern for FL and EX vehicles. It is expected that the traction system itself produces temperatures below 100 °C. The REESS however is point of concern, as long as cells are used that contain a flammable electrolyte and reactive elements in their electrodes.

14. Battery cells are supervised by an electronic system preventing over-charging, over-discharging, controlling power output protecting the cells, thus protecting the battery against a thermal runaway (battery management system or BMS).

However, a thermal runaway may also be caused by mechanical shock or external heat. Mechanical impact tests are included in R.100 for passenger cars and light commercial vehicles that do not apply to heavy vehicles. Although some tests are required for heavy vehicles, it is questioned if these are sufficient in case of vehicles carrying flammable substances or explosive substances and articles.

15. It is expected that R.100 will be updated in the future. For this the wording in the example is chosen to determine what is to be protected instead of giving detailed how to protect.

The measures how to comply are up to the vehicle manufacturer, making it not design restrictive. Measures can consist of lateral protection, heat insulation, guiding away the developed heat from the load, etc. To help the understanding the drafting of a “Guidance” document may be considered.

Other topics

Trailers

16. Re-generative braking on trailers is expected in the near future. Re-generative braking means also that traction may be provided. To allow for this the definition of trailer needs to be amended and many other vehicle regulations.

17. The issue for ADR is that there is a high voltage system, like on a truck. The REESS may present the same risks as those on trucks, in particular as the system is expected to be fully underneath the load. From a safety point of view, it is questioned if the same level of control and safety of the REESS can be guaranteed as on a motor vehicle.

18. Until R.100 is modified to include category “O”, it felt that fitting traction batteries or REESS to a trailer is not acceptable form a legal point of view.

19. For FL trailers being safe in an explosive atmosphere is a topic to address.

20. Finally, it should be stated that batteries have already found their way on trailers for powering accessories like product pumps or electronic steering axles. In the past lead-acid batteries were used but this will move to Li-ion as well. Some applications are not galvanically connected to the vehicles electrical system. ADR contains no provisions for dealing with these batteries.

Charging

21. Charging the REESS can be done under various conditions and by several methods. Charging will bring heat to the battery cells and as such a hazard. Hazards are limited by monitoring of the temperature by the BMS and cooling or degree of charging regulated appropriately.

22. It was felt that charging by Plug and Cable would be more appropriate for dangerous goods vehicles than a pantograph. On the other side, a pantograph used when the vehicle is parked might be safe under conditions. Use of pantographs during transport with overhead power lines was not supported.

23. It was felt that charging during handling of the load should be prevented, although this would be up to the risk evaluation for each site. Charging during (overnight)parking, while the there is a load present, is necessary and unavoidable. However, supervision and warning when the cooling system fails, or a critical cell temperature is reached was felt as a good counter measure.

New types of cabin heater

24. Currently GRSG of WP.29 is discussing a modification of UN Regl. No. 122 on heaters (driver’s cab or other items that need heating). Work is undertaken to include H2 heaters and consideration will start on the suitability of a new type of radiation heater. The suitability for vehicles carrying dangerous goods needs to be studied further.

Outside of the mandate.

Autonomous vehicles

25. It is felt that a position needs to be taken on the use of autonomous vehicles carrying dangerous goods. Will it be necessary that a person should be present in the drive’s cab?

Application of Electronic Stability Program (ESP)

26. Questions are asked on the application of ESP. Although all new vehicles within the European Union (EU) have to be equipped with this function, this is not automatically mandatory for contracting parties outside of the EU. It should be considered if reference should be included in ADR, also for contracting parties outside the EU.
