

Proposal

Annex 5

Guidance on demonstration of equally effective triggering performance

1. This guidance relates to the demonstration of equally effective triggering performance for approvals of vehicles with maximum mass between 8,000–12,000 kg according to Paragraph 4.1. It is intended to inform manufacturers, technical services and type approval authorities of a recommended way to achieve the required demonstration by simulating two relevant collisions.
2. Materials submitted by the manufacturer should include documentation of collision simulations and of EDR triggering mechanisms.
 - 2.1. Collision simulations
 - 2.1.1. Two vehicle-to-vehicle collisions should be simulated: One longitudinal collision and one lateral collision of the vehicle under approval (at maximum permissible mass) with a passenger car (at a mass of 950 kg) as collision opponent.
 - 2.1.1.1. The longitudinal collision simulated should represent an offset front-to-front collision of the vehicle under approval travelling straight, unbraked at [x km/h] against the collision opponent travelling straight, unbraked at [x km/h] in opposite direction. At impact, the vehicle under approval shall overlap the collision opponent by 40 per cent $\pm$ 20 mm on the steering-column side.
 - 2.1.1.2. The lateral collision should be simulated as a front-to-side collision of the stationary vehicle under approval being side-impacted in perpendicular direction by the collision opponent travelling straight, unbraked, at [y km/h]. At impact, the longitudinal vertical median plane of the collision opponent shall be coincident within $\pm$ 25 mm with a transverse vertical plane passing through the R point of the front seat adjacent to the struck side of the vehicle under approval.
 - 2.1.2. The simulations should be carried out using crash reconstruction or similar software. The vehicle under approval should be represented as best as possible with the adaptable input parameters of the software used. Alternatively, at the request of the manufacturer, results from more complex simulation software, such as finite element analysis, should be accepted.
 - 2.1.3. The documentation submitted for the collision simulations should allow the technical service to determine whether the simulations performed were generally valid and whether the changes in velocity experienced by the vehicle under approval were high enough to meet the mandatory triggering thresholds defined in UN Regulation No. 160 in both collisions. It should include at least information on the software used and documentation of the input parameters and relevant results of the simulation (including the longitudinal and lateral changes in velocity experienced by the vehicle under approval).
 - 2.2. EDR triggering mechanisms
 - 2.2.1. The manufacturer should submit technical documentation to show how EDR triggering would be achieved for the vehicle under approval in both

simulated collisions. This could include, for example, documentation of suitable change-in-velocity thresholds implemented, documentation to show that a non-reversible occupant restraint system would have been deployed or documentation of other suitable trigger mechanisms implemented.

Justification

This proposal relates to the demonstration of equally effective triggering performance for approvals of vehicles with maximum mass between 8,000–12,000 kg according to Paragraph 4.1 of UNR169. It is intended to inform manufacturers, technical services and type approval authorities of a recommended way to achieve the required demonstration. The approach set out in this proposal implements the concept previously presented to the working group in documents SG-EDR-41-02¹ and SG-EDR-42-03²; working group comments received during both meetings were taken into account.

The approach involves the manufacturer simulating two collisions (using crash reconstruction or similar software) and documenting to the technical service how EDR triggering would be achieved in these collisions. In line with working group comments, the collision geometry to be simulated was aligned with existing crash test regulations:

- The longitudinal impact is aligned with UNR94 (frontal crash of opposing vehicles with 40% overlap)
- The lateral impact is aligned with UNR95 (side crash in perpendicular direction)

The mass of the collision opponent is proposed at 950 kg, which is also aligned with existing regulation (UNR95 impactor).

Appropriate impact speeds for both collisions are yet to be defined. UNR94 and UNR95 were designed to represent high severity collisions and are referenced in UNR160 to ensure EDR survivability (i.e. as a reasonable worst case of expected collision severity). The speeds from these regulations are therefore not suitable for the task at hand, which is to define representative impact speeds which ensure that a large proportion of relevant collisions are captured. Collision data analysis would allow to define representative impact speeds if relevant data was available. A possible analysis approach and the required data were described in document SG-EDR-42-11³ (data required: slight, serious and fatal collisions of the proposed geometry, involving at least one vehicle with maximum mass between 8,000 - 12,000 kg, known impact speed). During the meeting SG-EDR-42, the working group suggested two potential data sources, both of which were subsequently investigated but ultimately found unsuitable:

- US FARS data: Not suitable because it only includes fatal collisions, i.e. not possible to identify at what impact speeds a reasonable proportion of collisions leads to serious injuries.
- US NASS data: CISS appears to be most appropriate source; however, the impact speed data field (“DVSPEED”), which is required for the intended analysis, is filled as “unknown” in all cases reviewed.

The data request set out in document SG-EDR-42 is therefore reiterated here (while noting that the longitudinal collision dataset should now include front-to-front impacts rather than front-to-rear).

¹ https://wiki.unece.org/download/attachments/262472087/SG-EDR-41-02%202024-10-22_EDR%20HDV%20Example%20Approach.pdf?api=v2

² <https://wiki.unece.org/download/attachments/267583708/SG-EDR-42-03%20Considerations%20on%20collision%20conditions%20to%20be%20analysed%20for%20approval%20of%20UNR160%20EDR%20for%208-12%20tonnes%20vehicles%20%28EC%2BDE%29.pptx?api=v2>

³ <https://wiki.unece.org/download/attachments/267583708/SG-EDR-42-11%20Addendum%20to%20Considerations%20on%20collision%20conditions%20to%20be%20analysed%20for%20approval%20of%20UNR160%20EDR%20for%208-12%20tonnes%20vehicles%20%28EC%2BDE%29.pptx?api=v2>