

**PROPOSAL FOR POSSIBLE AND NECESSARY REGULATORY WORK IN  
 RELATION TO BUS FRONTAL COLLISIONS.**

Transmitted by the expert from Hungary

**I. GENERAL COMMENTS**

Studying the available accident statistics, analysing a lot of individual bus frontal collisions, determining essential collision categories, considering the persons and systems to be protected in this type of accidents, the following general approach may be fixed to the solution:

- It is impossible to solve the problems with one safety regulation: there are different goals with different dangerous accident situations (standard accidents) that means different requirements and test methods.
- Some existing ECE regulations may be extended for buses or should be improved according to the new requirements.
- It is important to consider all kind of bus categories when thinking about future regulatory work.
- The Japanese and European work and activity on that field should be held together and harmonized in the future.
- Both GRSG and GRSP should be involved in this future work having a good and strong cooperation mainly in the general approach of the problems.
- GRSG should ask the support of WP29 to this work, because it is a rather complex one: it covers a very important, extended field of safety, more regulations are involved and touched, two WG-s should work in this - work and time consuming - process, etc.
- This will be a new type of action in WP29 and its WG-s, a multi-body cooperation, giving example for other future cooperation (e.g. between GRSG and GRFF in the subject of lateral stability of buses rollover avoidance with electronically controlled stability systems)

**II. SUMMARY TABLE**

The table below summarizes the possible and needed activities on the field of safety in bus frontal collisions. The proposed priorities and the responsible WG-s are also listed in the table, as well as the needed effort, work is also estimated.

	Object of regulatory work	Related ECE regulation	Related EU directive	Responsible WG	Proposed priority	Estimation of needed work
1.	Strength of bus seats and their anchorages	R.80/01 R.17/04	91/676-03/20EC	GRSP	A	M
2.	General safety of buses (all kind)	R.17/Rev.1.	2001/85/EC	GRSG	B	M
3.	External projection	R.61/00		GRSG	B	S
4.	Safety belt anchorage	R.14/05 R.16/04	76/115-96/38EC 77/541-00/3EC	GRSP	B	S
5.	Structural integrity	R.107/Rev.1*	2001/85/EC	GRSG	A	M
6.	Underrun protection	R.93/00	92/114/EC	GRSG	B	M
7.	Limit of deceleration	-	-	GRSG	B	L

8.	Compatibility and aggressivity	-	-	GRSP	B	M
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*Symbols:*

A = first priority

B = second step priority

\* = it could be an independent new regulation, too

S = short work, less than 2 years, it does not need further study and analysis

M = medium size work, 2-4 years, it needs certain study

L = Long term work, more then 4 years, further study, analysis, international discussion is needed

The first six objects in the table have certain basis, background among the existing regulations, but the last two ones do not have this.

Some more details, proposals are mentioned below to the objects listed in the table

### III. POSSIBLE MODIFICATION (EXTENSION, IMPROVEMENT) OF EXISTING REGULATIONS

#### 1. Strength of bus seats and their anchorages R.80.

- The scope should be extended to all bus categories, including city-buses, too (their seats and seat anchorage also need certain strength requirements and the passengers behind them also need certain protection, may be different from the tourist coaches)
- All kind of seats (driver, passenger, crew) and seat arrangement (rearward and inward facing seats, folding seats) should be considered
- Children seats and adequate restrain system should be involved
- May be the wheel-chair restrain systems could be involved into this regulation
- Strength requirements should be reconsidered according to the use of seat belts (the load on a seat, but not on all of them may be doubled: from the belted passenger seating on the seat and from the passenger seating behind the seat but using no seat-belt)
- Extension and/or generalization of deceleration plus to all kind of buses (M<sub>2</sub>, M<sub>3</sub>) and seats
- Analyse relation between R.80 and R.16.
- Seat and vertical handhold combination to be considered

#### 2. General safety of buses. R107/Rev.1

- Safety features of walls in front of passenger seats
- Safety features of partition (e.g. at stair cases) in front of passenger seats
- Avoidance of ejection of bus occupants (driver, crew, passengers) through the windscreen
- Strength requirements of handholds
- Reducing aggressivity of inside structural parts against passengers (inside collision)

#### 3. External projection of commercial vehicles R.61

- Extension of the scope to buses
- Consider the different size and position of bus front walls and their accessories like windscreen wiper, bed of head-lamp, etc.
- Consider the shape of the lower part (skirt) of the front wall
- Think about bull-bars and similar structural elements

- Think about rear view mirrors having low position
4. Safety belt anchorages R.14.  
Think about the use of safety belt on special seats (driver, crew, children, folding, rearward facing seats, etc.)
  5. Structural integrity of the front part of the bus. R.107/Rev.1.
    - The requirements should serve several goals: to protect the occupants in the direct deformation zone (driver, crew if any, passengers in the first row of seat) and to protect the vital control systems (steering, braking, electric and electronic, etc.
    - Survival space should be defined
    - Energy absorbing capability of the structure
    - All categories of buses should be considered
    - It could be a new Annex of the contracted bus regulation (R.107/Rev.1.) This solution follows the earlier practice (like structural integrity in case of rollover, which is an Annex to R.107/Rev.1.)
    - The approval test method(s) based on the multipurpose requirements should be simple and flexible, the frontal collision test of complete buses is not recommended
  6. Front underrun protection R.93.
    - To avoid small car (and van) underrun
    - To protect the main control systems (break, steering, electrical, etc.) of the bus
    - These subjects could be combined with the driver protection if the driver compartment has low location
    - All kind of bus category should be considered

#### **IV. POSSIBLE NEW REGULATIONS**

7. Limitation of deceleration. (Strength and energy absorbing capability of underfloor structures)
  - The seats and their anchorages are tested according to a described deceleration pulse for an impact speed of 30 km/h against a rigid barrier.
  - Now there is a lack of requirements for the underfloor structures providing not higher deceleration then it is used for seat approval (otherwise the seats are not strong enough, the passengers are not protected)
  - The deceleration is in strong relation with the strength and energy absorbing capability of the underfloor structure and these requirements should be harmonized with the requirements of structural integrity
  - All bus categories should be considered (where the seat requirements are used)
8. Increasing compatibility and reducing aggressivity of bus bumpers in relation to partner vehicles in frontal collisions
  - Mainly cars, vans, and other vulnerable road users should be considered as partners.
  - The main geometry (size, location) should be regulated, as well as the surface requirements
  - The strength requirements should be harmonized with the underrun protection.