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INFORMATION ABOUT FRONTAL COLLISION OF BUSES

(Necessary and possible regulatory works)

Transmitted by the representatives of Hungary and Spain

1. Preparation of proposals

- Spain raised to problem of frontal collision of buses in 2003 (on the 84th GRSG session) Hungary supported to analyse this question and some other countries joined to this action.
- Two ad-hoc meetings of experts were held in Madrid (September 2003, March 2004) discussing this subject.
- APSN workshop (as part of the 6th Framework Project, Brussels) was organized in Budapest (September, 2004) and the second one will be held in Prague (March 2005) also dealing with this subject.
- On these meetings altogether 31 experts participated from 8 countries, collecting the accident statistics and other information from 10 countries.
- Some thousands bus accidents were considered, roughly half of them were frontal collision. Some hundreds bus frontal collisions were analysed more or less in detailed, including the injury mechanisms, too.
- The main conclusion of these studies was that the frontal collisions of buses are among the most severe, dangerous accident types (both for the bus occupants and the other road users) causing a high rate of casualties.

2. Goals of the possible regulatory work

- To protect the bus passengers
- To protect the bus drivers
- To protect the bus crew, if any
- To protect the main control systems of the bus (break, steering, electrical, etc.)
- To protect the other road user vehicles and their occupants
- To protect the pedestrians

3. Possible solutions

It is impossible to cover all these subject with one regulation. Parallel running activities are needed in different ways:

- Modifying, developing existing regulations
- Extending the scope of existing regulations covering buses, too (of course that could mean certain technical modification of the regulation)
- Developing new annex to existing regulations
- Developing new regulations

Both GRSG and GRSP should be involved in this future work and WP29 could support and control this multi-body cooperation.

4. Summary of the estimated work

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.

Table I.

	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	96/37EC	GRSP	A	M
2.	General safety of buses (all kind)	R.107/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	M
5.	Structural integrity	R.107/Rev.1*	2001/85/EC	GRSG	A	L
6.	Underrun protection	R.93/00	92/114/EC	GRSG	B	M
7.	Limit of deceleration	-	-	GRSG	B	L
8.	Compatibility and agressivity	-	-	GRSP	B	M

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 deep 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.

Further details about these regulatory works may be found in Annex 1. (What are behind the objects listed in Table I.)

Annex 2. collects the list of informal GRSG documents available on the internet, giving more information about the subjects, belonging to the frontal collision of buses (This documents were produced by the expert meetings mentioned in para.1.) some of these documents contains further list of publications dealing with the frontal collision of buses.

5. How to go on? Possible next steps

- GRSG will continue to discuss this subject on its April Meeting
- Spain and Hungary is ready to give more detailed information (presentation, documents) to GRSG on its next, May meeting.
- Both GRS(s) could report to WP29 what end how to do in the next steps, in the future.

- Common expert group(s) could be established by the two GRS(s) in special subjects, where both groups are interested (eq. combined driver and under-run protection, crew protection integrity of bus structures, etc.) It should be considered that the bus experts are working mainly in GRSG.
- WP29 could invite other forums, bodies (for example APSN, EEVC) to support this activities, to help to solve the problem of lack of information and knowledge

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Annex 1.

MORE DETAILED EXPLANATIONS TO THE OBJECTS OF THE REGULATORY WORK

(See Table 1.)

A). POSSIBLE MODIFICATION (EXTENSION, IMPROVEMENT) OF EXISTING ECE REGULATIONS

1. Strength of bus seats and their anchorages (R.80.)
   - The scope should be extended to all bus categories, maybe 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)
   - Consider EU directive 2001/85 Annex7
   - All kind of seats (driver, passenger, crew) and seat arrangement (rearward and inward facing seats, folding seats) should be considered
   - 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 pulls to all kind of buses (M_2, M_3) and seats
   - Analyse relation between R.80 and R.16.
   - Seat and vertical handhold combination to be considered (also interior fittings)

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, too avoid ejection of bus occupants (driver, crew, passengers) through the windscreen
   - Strength requirements of handholds
   - Reducing agressivity 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.)
   - Children seats and adequate restrain system should be involved
   - May be the wheel-chair restrain systems could be involved into this regulation

5. Structural integrity of the front part of the bus. (R.107/Rev.1.)
   - 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 Annex 5 to 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 for the driver (and crew)
   - Energy absorbing capability of the structure
   - All categories of buses should be considered (small and large, low floor and HD)
   - 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.)
   - Extension the scope to buses, too.
   - 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

B). POSSIBLE NEW REGULATIONS

7. Limitation of deceleration. (Strength and energy absorbing capability of underfloor structures)
   - Harmonization of the stiffness of the bus structure with the deceleration pilse and seat requirements according to different bus categories.
   - 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

8. Increasing compatibility and reducing aggeressivity of bus bumpers in relation to partner vehicles in frontal collisions (Safety bumper)
   - 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.

Annex 2.

LIST OF GRSG INFORMAL DOCUMENTS (ID) BELONGING TO THE SUBJECT OF BUS FRONTAL COLLISION

GRSG-ID No.5	Report about the first Madrid meeting
GRSG-86-13	Drawn report about the two meetings held in Madrid
GRSG-86-11	Accident statistics (Frontal collisions of buses)
GRSG-86-23	Typical bus frontal collisions
GRSG-86-12	The role of full-scale frontal impact test of buses
GRSG-86-24	Persons and systems to be protected (Frontal collision of buses)
GRSG-87-14	Information about the APSN meeting held in Budapest (Sept. 2004)
GRSG-87-31	Proposal for possible and necessary regulatory work in relation to bus frontal collisions