

Technical requirements for sleeping coaches in Denmark

After a couple of tragic accidents in 2004 involving Danish sleeping coaches (coaches with horizontal berths), driving on the motorways in Germany with a speed of approximately 100 km/h, the Danish safety requirements for sleeping coaches were thoroughly revised.

The aim was to ensure the same level of safety for passengers in sleeping coaches as for passengers in ordinary coaches using safety belts.

To achieve this purpose, Denmark introduced two requirements:

1. Requirement 1 Safety partitions must be installed in the front of each berth. The safety partitions must have sufficient strength and must be able to yield, thereby absorbing some energy in the case of a collision where the passengers are thrown forward.



Example of safety partitions attached to the safety belt anchorages of the bus seats.

2. Requirement 2 Sleeping coaches must be equipped with a digital display showing the travelling speed of the bus. The display must be visible to the passengers. The purpose of the display is to make it possible for the passengers to keep an eye on the speed at which the coach is travelling. The idea is that this will motivate the driver to respect the speed limits what is particularly important for sleeping coaches. In some countries, such as Germany, the coaches are only allowed to drive with a maximum speed of 80 km/h when the seats are converted into sleeping berths, whereas the bus is allowed to drive with a maximum speed of 100 km/h with the seats in the upright position.



Denmark is well aware of the fact that since the passengers are not required to wear safety belts when they are lying down, they will not be well protected in a case of roll-over.

Denmark, however, finds it reasonable to assume that, due to the lower speed limit of sleeping coaches, a limit which we try to make sure is respected by requiring the speed display, sleeping coaches will be less likely to be involved in roll-over or other accidents than ordinary buses.

We, therefore, find it reasonable to say that a sleeping bus conforming to the new Danish regulations offers to the passengers roughly the same safety as a conventional coach equipped with safety belts.

The technical requirements for the sleeping coaches can be listed as follows:

Definition of sleeping coach:

A sleeping coach is a vehicle of category M₂ or M₃ where all or some of the seats can be converted into sleeping positions. A seat where the seat back can be inclined up to 45 degrees is not considered to be a sleeping position.

Access to doors etc.

1. The regulations regarding access to the doors of vehicles of category M₂ or M₃ respectively must be complied also when the seats are converted into horizontal sleeping positions.
2. The centre gangway, however, can have a width of less than 400 mm measured at the height of the upper berths, if:
 - The centre gangway measured at both the lower and upper berths has a minimum width of 300mm, and
 - All windows next to the berths are emergency windows with tools for breaking the windows.

Seats, safety partitions etc.

1. The construction of the seat must include devices which keep the seat construction securely in place, also when the seat is converted into a sleeping position.
2. Safety partitions that can prevent the passenger from being thrown forward in the event of hard braking or collision must be placed in front of all sleeping positions.
3. The safety partition must have a height of a minimum of 300 mm above the uncompressed seating position and must cover the full width. The vertical distance from the seating position up to the lower edge must not exceed 70 mm.
4. The safety partition must be able to withstand a static load in the forward direction of at least 10 kN. The load must be applied at a height of 250 mm above the sleeping position. The applied load must give the safety partition a horizontal deformation of at least 100 mm but no more than 300 mm.
5. Safety partitions, which are tested according to the dynamic test of the German regulations on safety partitions, are considered to conform with the requirements of paragraph 4. above.

Speed display visible for the passengers

A sleeping coach must be equipped with a digital speed display visible for the passengers. For double-deck buses, this applies to both decks. The minimum height of the numbers, which show the speed, must be at least 5 cm.
