

# Implementation of the UNECE R66 Regulation for Safer Bus Body Structure in Malaysia



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**B**uses are a very important mode of transportation. They can be used for short and long distance ground travel. They are very competitive price-wise when compared with air travel and trains. Air travel may offer greater comfort and a shorter travel time but passengers are required to spend time at the airport for checking in, luggage check-in, security check, Immigration check and Customs inspection etc. For long distances, travel by train may take a longer time than air travel but trains are less noisy than planes and buses.

In Malaysia, buses are important for economic reasons because they are affordable and can go to places which may not be serviced by other modes of transport. There are different types of buses as defined by Ministry of Transport (MOT) Malaysia: Stage bus, express bus, minibus, industrial workers bus, feeder bus, chartered bus and school bus (Table 1). About 500 buses are registered with MOT every three months. As at 31 December 2013, there were 62,672 buses on the road (MOT, 2014).

In the recent years, the number of accidents involving buses is increasing at an alarming rate. Table 2 shows bus accidents that involve fatalities. On 13 August 2007, 22 people died in a bus accident at Bukit Gantang, Perak.

One factor that contributed to the deaths was that the roof of the bus did not comply with the United Nations Economic Commission for Europe (UNECE) Regulation No. 66. In the accident, the entire roof was separated from the body of the bus, and the pillars were fractured (MIROS, 2009). The rollover was one of the worst bus accidents in the country and it claimed many lives (Lin & Nian, 2006).

After the Bukit Gantang accident (Photo 1), the bus construction law based on UNECE R66 was adopted into the Malaysia Road Transport Rule and now, every bus or coach builder has to abide by the UNECE R66 requirements. The Road Transport Department is the agency that enforces the new regulations.

The UNECE R66 applies to single-deck rigid or articulated vehicles designed and constructed to carry more than 22 passengers, whether seated or standing, in addition to the driver and crew.

The regulations ensure that the superstructure of the vehicle is strong enough to protect the residual space during and after the rollover of the vehicle.

Table 1: Types of buses in Malaysia (reprinted from various internet sources)



The superstructure of the bus contributes to its strength. The residual space is where passengers, driver and crews are located. Parts such as pillars, safety rings and luggage racks should not intrude into the residual space during a rollover. In addition, no parts from the residual space should

Table 2: Bus accidents with fatalities in Malaysia.

No.	Location	Date	No. of Deaths
1.	KM 229.1 PLUS Expressway Bukit Gantang	13 August 2007	22
2.	Jelapang North South Expressway Toll Plaza	11 December 2007	8
3.	KM 146.5 PLUS Expressway - Tangkak	7 December 2008	10
4.	KM 272.8 PLUS Expressway	26 December 2009	10
5.	KM 223 PLUS Expressway - Simpang Ampat	10 October 2010	15
6.	KM 15 Jalan Cameron Highlands - Simpang Pulai	20 December 2010	27
7.	KM 3.5 Jalan Genting Highlands	21 August 2013	37
8.	KM 11 Jalan Kuantan-Kuala Lumpur	12 April 2014	3

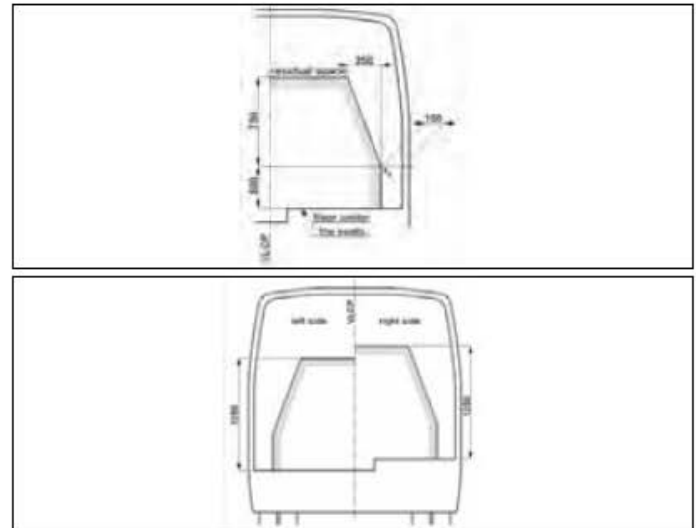
project outside during rollover. The specified residual space as per UNECE R66 (UNECE, 2006) is shown in Photo 2.

The four types of tests as defined by UNECE R66 (UNECE, 2006) are:

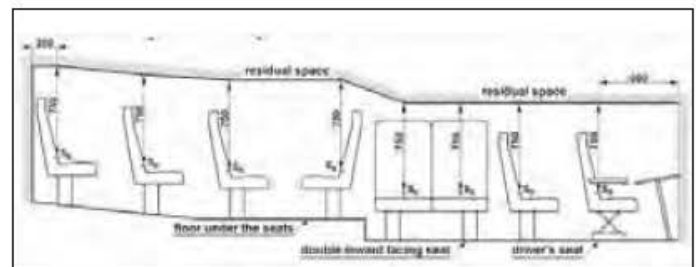
1. Rollover test on a complete vehicle as the basic approval method
2. Rollover test on body sections which are representative of the complete vehicle
3. Quasi-static loading tests of body sections
4. Computer simulation with dynamic calculations of the basic rollover test on a complete vehicle



Photo 1: Bus accident at Bukit Gantang, Perak in 2007 (Photo reprinted from MIROS, 2009)



a) Lateral arrangement



b) Longitudinal arrangement

Photo 2: Residual space in a bus (photo reprinted from UNECE, 2006)

Malaysia coach builders are not in favour of items 1 to 3 because these are expensive and time consuming. They prefer computer simulation instead.

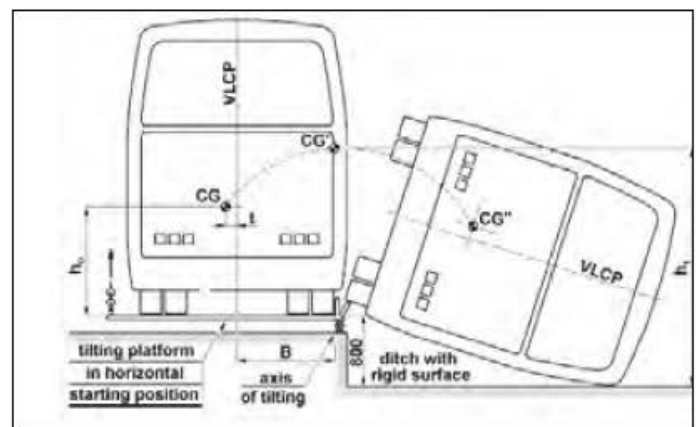


Photo 3: Rollover test on the tilting platform (photo reprinted from UNECE, 2006)

Based on UNECE R66, the rollover test on a complete vehicle is a lateral tilting test. As shown in Photo 3, the bus is put on the tilting platform with blocked suspension. During the test, the platform will be tilted at a constant speed until the bus is in an unstable equilibrium position. The rollover test starts here with zero angular velocity and the axis of rotation runs through the wheel-ground contact points. The bus falls to the ground from an 800mm high platform.

## SUMMARY

A bus rollover is a serious matter. There have been many deaths caused by rollovers. Because of this, the Malaysian government, through the Road Transport Department, has enforced the UNECE R66 regulation to protect bus passengers or reduce the number of casualties from accidents caused by rollovers. Different parties such as government agencies, coach builders and consultants need to work together to ensure the implementation of UNECE R66. ■

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