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EFFECTIVENESS OF REINFORCEMENT MEASURES FOR BUS WINDOWS

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In June 2003 an assault was committed upon a bus of the German Bundeswehr in Kabul. Thereby, four persons died and 29 persons were severely hurt. The medical examination showed that most of the injuries were caused by glass debris coming from the bus windows.

In consequence, the load limit of bus glazing at a blast loading resulting from a conventional detonation was determined in the Large Blast Simulator of the WTD 52. Original glazing, reinforced windows and alternative window materials were tested. The threshold for unreinforced windows was determined to be at 12 kPa maximum side-on pressure, this corresponds to a detonation of 10 kg TNT in 20 m distance. The threshold for any of the tested enforcement measures was exceeded with 45 kPa (116 kg TNT / 20 m).

All the conducted safety measures resulted in a significant reduction of glass fragments but partly lead to hazards occurring due to the mass of the window crossing the bus interior. PVC foils as an alternative for bus windows showed the best results with respect to all environmental conditions and substantially reduced the hazard of injuries from glass debris for the passengers.