

## **Windscreens - Their Role in Penetration Resistance and Occupant Security**

There has always been a trend to maximise visibility for passengers in coaches by designing bodies with larger and more panoramic windscreens, creating a modern bright interior with enhanced sightseeing possibilities. Thus, the glazing of a coach can have an immediate influence on the attractiveness of a vehicle for the passenger and, therefore, the coach buying operator.

In the past 10 years we have seen the emergence of full 2m high one-piece coach windscreens (monoblocs) from European coach builders, increasing the windscreen area by 70%, from 3.5m<sup>2</sup> on coaches in the 1990s to up to 6m<sup>2</sup> on coaches today.

Also in this time span we have seen the passenger deck raised and the driving position lowered, giving all occupants an unobstructed view forward out of the larger windscreen. We have also seen the emergence of the determined thrill-seeking vandal who seeks pleasure by throwing or shooting missiles at bus, coach and train windows and, more recently, the dropping of heavy objects from bridges into the path of such vehicles. Whilst buses are generally slower and do not use motorways and dual carriageways, and trains are reasonably protected with multi-laminate windscreens, coaches with large windscreens seem exceptionally at risk to occupant injury from these attacks.

The thickness of laminated windscreens in European coaches hasn't much changed since their introduction in the 1980s, with constructions nominally 4mm outer, 0.76mm PVB and a 3mm inner. It is this plastic membrane that was originally designed to keep occupants within the confines of a vehicle in the event of a frontal collision. It is this same part, at the same specification, that is being called to perform a reasonable degree of penetration-resistance to an impact attack that it has not really been designed for.

It is this combination of a larger glass area, the vulnerability of the driver and passengers seated behind and the increase in instances of objects purposely dropped from bridges that has called for research by the industry into better protection. The conscious consumer is expecting higher levels of security and safety from their transport provider. PSV Glass can demonstrate that, if a reasonable degree of penetration-resistance to an impact attack is provided for the larger coach windscreens, there will be a commensurate benefit in occupant safety.

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