

## Virtual techniques for bus roof strength test, the conditions of VT application

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The ECE R66 regards to the adequacy checking of bus superstructure strength and this regulation specially allows not only real roll-over test but the usage of different computer techniques, virtual technologies too.

The future trend in the vehicle regulations is to widen the possible applications of VT and it is a very sensitive question both for test centres and approval authorities. There are many test centres and engineering offices in Europe which carry out computer control calculations on partials or full-scale bus structure for determining the bus roof strength conformity due to the official ECE 66.01 regulation. In spite of this the used techniques and the results are not adequately validated and controlled; the VT conditions are not clarified.

The paper shows a complete bus structure's detailed roll-over simulation and it formulates the experienced difficulties through the analysis and assumes the conditions which should be fulfilled and public by the VT user and the bus manufacturer for approval inspectorate or for the control computations.

These criteria shall be extended for:

- model layout (elements type and size, material and geometrical model, glass installation, contact model,...)
- model ability to correlate elastic/plastic deformations and rupture
- mechanical, kinematical simulation of roll-over (the kinematics in the impact process, concrete surface parameters)
- calibration and validation tests
- applicability of different FE codes
- benchmark tasks,...

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