

## **SIMULATION AND TEST ON EXPLOSION RESISTANCE OF TUNNEL LINING CONCRETE USING 3D-AUTODYN AND SHOCK TUBE**

**Jaewon Shim, Jiyoung Rhee, Taesun Chang, Nagyong Kim**

*Korea Expressway Corporation<sup>1</sup>*

[his2pass@ex.co.kr](mailto:his2pass@ex.co.kr), [need@ex.co.kr](mailto:need@ex.co.kr), [tschang@ex.co.kr](mailto:tschang@ex.co.kr), [ynagkm@ex.co.kr](mailto:ynagkm@ex.co.kr)

### **Abstract**

3D-AUTODYN, which is a commercial computer simulator, and Shock Tube, the test simulator of a virtual explosion, were used to re-enact blast waves in various forms of condition in order to simulate actual explosions and their effects of lining concrete for a vehicle explosion. First of all, the energies of BLEVE of vehicles passing on highway tunnel were calculated in the form of the TNT equivalent, and then we performed the simulation of BLEVE of a lorry by applying to the maximum 50kg of TNT equivalent as the input data on the 3D-AUTODYN. And then, the artificial shock waves, which are equivalent to the explosive pressure of a van, were applied through a shock tube in order to verify a limitation of small vehicle explosion and the test simulations to the same specimen were repeatedly carried out 6 times. As a result, the simulated damage, such as the maximum deformations, support rotations and others, and the shock damage were rarely found and both deformations were less than about 0.6 mm. Then the guidelines based on these data would be given to field officer for the tunnel maintenance, and it will be used as reasonable data for explosion event in future.

**Keywords:** BLEVE, TNT-equivalent, AUTODYN, Shock tube, Vehicle explosion

---

<sup>1</sup> South Korea