

# **BLAST RESISTANT WINDOWS – EXPERIMENTS AND SIMULATIONS**

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Fragments from glazing exposed to blast loads represent a serious hazard to personnel, and various types of blast resistant windows are developed to reduce the consequences of accidental explosions or malicious attacks. Federal Institute for Materials Research and Testing (BAM) has several years of experience from full-scale experimental testing and certification of blast resistant windows according to the US General Service Administration (GSA) standard. The most common experimental procedure entails the detonation of a spherical charge of 100 kg of trinitrotoluene (TNT) at a distance of 25 to 45 meters from the test sample. Pressure gauges monitor the pressure-time profile next to the sample, and the actual impact on the window itself is derived from simulations with AUTODYN<sup>®</sup> from ANSYS. The AUTODYN software includes a finite element (FE) module for computational structural dynamics and a finite volume solver for transient computational fluid dynamics (CFD). Blast wave propagation and loading will also be simulated with FLACS-Explo from GexCon. FLACS<sup>®</sup> is a finite volume CFD code used for hazard assessments in the process industries, and FLACS-Explo simulates blast wave propagation from detonation of high explosives. The paper presents the progress in experimental testing over the last seven years, the added value of detailed numerical simulations of structural response, and the potential for applying simplified CFD simulations for risk assessment purposes.