URBEX: A FAST YET ACCURATE MODEL TO COMPUTE BLAST CONSEQUENCES IN URBAN GEOMETRIES

Guillaume Chereau[1], Emmanuel Lapébie[1], Isabelle Sochet[2]

[1] *PRISME EA 4229, INSA Centre Val de Loire, 88 bd Lahitolle 18022 Bourges, France;*
[2] *APEX SOLUTIONS, 121 Impasse du Frau, 46320 Flaujac-Gare, France*

Key words: Fast-running model – Explosion – Bombing – Urban area

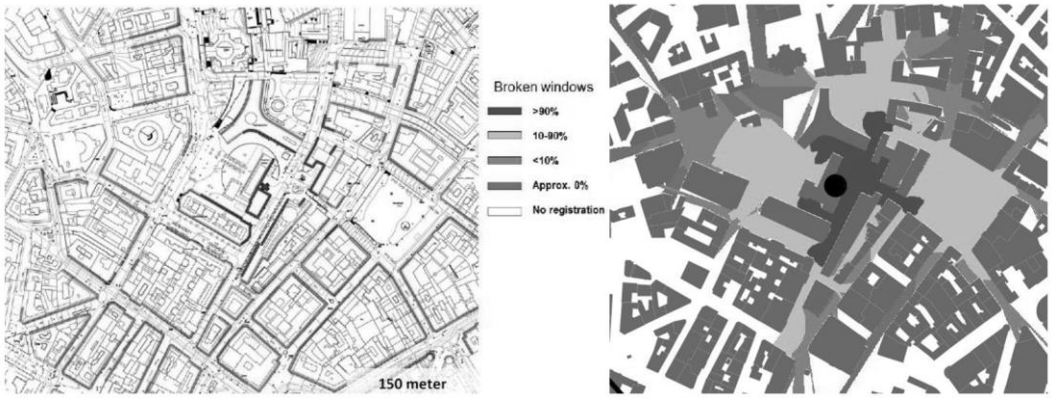
We present the research project URB(EX)^3, co-funded by the French National Research Agency (grant #ANR-21-CE39-0016), which aims at developing a breakthrough fast-running, meshless model for the assessment of blast consequences in urban configurations.

The expectations and requirements of the model will be detailed, together with the previous international state-of-the art and existing tools. Primary expectations are the ability to work with widely available city data (Geographic Information Systems file formats), a short running time (less than one minute on a standard laptop) and the ability to deal with all urban phenomena: diffractions, regular and Mach reflections, channeling in city streets) and urban canopy bypassing.

The URB(EX)^3 project includes high-fidelity, small-scale experiments performed at INSA Centre Val de Loire using propane-oxygen explosions. Analytical experiments cover the individual phenomena encountered in urban configurations, some of them being presented in companion papers (diffractions and street channeling). More global experiments (single and multiple obstacles, donor street / acceptor street configurations, full district…) have also been performed as validation cases for the model.

A large number of 3D simulations using the Viper::Blast software (https://www.viper.as/) have been done. Each experiment has been simulated, as well as explosion configurations with solid high-explosives, from simple ones to urban-scale explosions.

The results of the new model will be compared to experiments from various sources, numerical simulations and RETEX from actual events.



Restitution of the Oslo bombing (% broken windows):
Left: Field surveys [Christensen, 2011], Right: URBEX code