URBAN CANYON BLAST LOAD CALCULATIONS

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Malicious attacks represent a serious hazard in many parts of the world. Blast waves from detonation of condensed explosives can cause loss of life and severe damage to property. The targets are not necessarily limited to strategic infrastructure, nor are such threats restricted to high-tension regions. One recent example is the car bomb that killed eight people in Oslo on 22 July 2011. From the point of view of societal risk, it is important to optimize the design of protective structures relative to realistic loads from potential explosions. The decay of an idealized blast wave can in principle be estimated from empirical correlations. However, in order to account for the effect of complex geometry, reflected shock waves and focussing effects, it is necessary to use more sophisticated methods, such as computational fluid dynamics (CFD).

The finite volume CFD tool FLACS-Explo has been used to simulate a series of urban blast experiments at scale 1:5. FLACS-Explo solves the Euler equations with a conservative shock-capturing scheme, so-called flux-corrected transport (FCT). Charges of 0.4 and 1.6 kg PETN were detonated in various positions in a geometry consisting of four 2.3 metre cubical concrete blocks, representing buildings at an intersection. The results illustrate that the use of CFD tools can provide valuable input to risk assessments and design of protective structures in urban environments.