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BLAST BEHIND STREET JUNCTIONS ORIGINATING FROM VEHICLE BOMBS

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Model tests at a scale of 1/40 and numerical simulations were performed to assess the potential hazard to unstrengthened buildings from the detonation of a vehicle bomb in a city. The influence of street junctions on the blast overpressure was investigated. Two types of 'single street junction' were selected, termed tee junction and crossroad. A narrow long straight street with a 1000 kg vehicle bomb detonating at its beginning was used as a reference. Pressure-time histories were measured at larger distances from the street junction to meet the critical pressure and the critical impulse that must act on the unstrengthened buildings to cause a certain damage level. Above a critical blast impulse I = 500 kPa-ms and a critical blast overpressure P = 50 kPa almost complete demolition is expected. Below a critical impulse I = 100 kPa-ms or below a critical pressure P = 5 kPa the house remains habitable. This defines the range of interesting blast parameters. A unexpected observation was that at larger distances neither the tee-junction nor the crossroad caused a blast overpressure reduction. In the branch streets behind the junction higher peak pressure and higher blast impulse were measured than at the same distance in the straight street without a junction. For example in the tee-junction one half of the blast energy enters each branch, but higher blast overpressure and higher overpressure impulse is available in both branches than in a straight street without a junction. It will be discussed that neither blast overpressure nor overpressure impulse is a valid indication of blast energy. Blast reflections increase the potential hazard by increasing peak overpressure and overpressure impulse without increasing the blast energy.