

P60 Blast Ingress Through Failing Laminated Windows

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Abstract:

On July 22nd 2011 a 950 kg vehicle bomb exploded in downtown Oslo, killing eight people. The bomb was placed outside the prime ministers office and the blast rendered useless several of the surrounding governmental buildings. Studying the damage on these buildings, after the bombing, it was observed that blast ingress through failing facades had produced damage extending deep into the buildings.

In an effort to evaluate methods for calculating the blast ingress through failing facades a set of full scale experiments was performed in 2013 by the Norwegian Defence Estate Agency. In the experiments a facade with a laminated glass window was subjected to blast waves from 400 kg TNT explosive charges at 15, 25 and 45 m stand off. For a distance of 15 and 25 meter the laminated windows failed catastrophically and were thrown violently into the chamber behind causing a pressure build up in the instrumented volume.

This paper reports the results from the experiments and a numerical study investigating a method for calculating the blast ingress. The method uses a computational fluid dynamics (CFD) code for the fluid phase and a rigid body solver (RBS) for the window to calculate the blast ingress behind the failing windows.

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