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A Simplified Approach to Investigating an Explosion Source from the Effects to Buildings and other Confined Structures

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Abstract

Often when investigating the cause of an explosion occurring within a structure, the type and magnitude of explosive material, and the point of origin can be difficult to ascertain. This is particularly true of vapor cloud explosions, or if the explosive material is mixed, such as propellants with high explosives. This paper offers to discuss an approach for determining these elements of an accidental explosion. The method of a simplified approach utilizes the evidence collected in the field to reverse engineer the events that took a structure from its original to its final configuration. First order physical estimates and energy balance methods are utilized to determine fragment velocities, structural deformations and failures. The loads required to cause the observed damage is then used with confined explosion data of pressure and impulse. Several load cases can be determined quickly to eventually resolve, to a limited degree of certainty, the origin, type and magnitude of explosive material. The results can then be used as the start point for a more sophisticated computational analysis. An example of the analysis method was applied to an accidental vapor cloud, non-ideal explosions. The results are discussed, with the conclusion that this process can be useful. Additionally, the process can become more automated with current computer technology, and utilized in a predictive manner to estimate survivability of structures from specific attacks.