

Abstract

The New York City Police Department identifies prominent buildings at high risk of terrorist attack via blast loading using a risk-tiering analysis system. The vulnerability of a building is measured by its adjacency to other high-risk buildings, accessibility, and structural performance. The structural performance of a building measures the building's capacity to physically withstand an attack that presents abnormal loading. To simplify the task of determining structural performance, complex blast loads are often simplified as static loads on the building's structure. It is proposed that this oversimplification of the blast-loading environment results in excessively high building responses and stresses and ultimate overdesign of the structure. It is further proposed that these static analyses should be replaced with non-linear dynamic elasto-plastic analyses to more accurately determine the structural response of the building under blast loads. This paper examines a number of simple frame structures and compares analysis results from static loads representing the blast to those of full non-linear dynamic elasto-plastic analyses. It is concluded that the analysis of the structures using non-linear dynamic elasto-plastic procedures results in a more realistic representation of the structural response of the systems, and will ultimately result in more cost efficient designs.