

# Investigation of Progressive Damage Index of steel Wall-Post under Blast Loading

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## Abstract

The local seismic design codes suggest the use of vertical and horizontal steel braces to improve the seismic resistance of infilled-walls. However, very few studies on the seismic reinforcement of non-structural members have assessed the possible damage to steel-reinforced systems under direct impact of explosion. This paper explores the damage caused to steel wall posts as the tie for infilled-walls under blast loading. Hence, a 3-story concrete frame with an earthquake-resistant infilled-wall was subjected to blast loading in ABAQUS on the large dimension using two 300- and 1000-kg explosive masses at the 5-m and 10-m distances from the structure foot on the ground level. The progressive damage index including the ductile metal damage and shear damage indices for the steel material was used as the criterion in numerical assessments. The research results revealed that with an increase in explosive mass and a decrease in explosion radius, the damage escalates and the omission of structural members is more probable, resulting in a more critical explosion. It is also concluded that the damage to the lower stories is critical. Therefore, the resistance of the reinforcement systems used to increase seismic resistance should be examined under blast loading.

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**Key words:** Masonry, infilled-wall, Seismic Design, blast Loading

## 1. Introduction

Besides the increased effect of destruction caused by terrorist attacks to Iran, more studies are being carried out on passive defense. Non-structural members such as masonry infilled-walls in the external dimensions of buildings are highly vulnerable to blast loading, and thus, their resistance to these loads shall be examined. According to seismic codes, the seismic