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Near-field Explosion Effects on Behaviour of Reinforced Concrete Columns: a numerical investigation

Abstract: Recent terrorist attacks and accidental explosions involving hazardous materials around the world have increased the need to study the behaviour of structures subjected to blast loadings. Most research work investigating the behaviour of reinforced concrete columns to blast loading have concentrated on their response to planar loading from far-field explosions. Limited amount of work is available on the effects of near-field explosion on the behaviour of reinforced concrete columns. This thesis presents the results of a numerical study designed to investigate the effects of near-field explosions on the behaviour of reinforced concrete columns. The numerical investigation is a follow up on a project to a live explosion testing of reinforced concrete columns subjected to explosion from scaled distances ranging from 0.25 to 1.0 $m/kg^{1/3}$. The experimental results are used to validate the numerical models which are then used to conduct parametric studies to evaluate the effects of scaled distance, and concrete properties on the response of reinforced concrete columns. The numerical analysis showed that for increasing charge masses, the natural period of vibration of reinforced concrete columns increased. Also the effects of tie spacing were markedly noticeable at lower scaled distances. Peak column deflections at higher scaled distances occurred mid-height while peak column deflections at lower scaled distances occurred closer to the column supports.

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