EARTHQUAKE AND BLAST RESISTANT REINFORCED CONCRETE BUILDINGS FOR SRI LANKA

THESIS SUBMITTED TO THE DEPARTMENT OF CIVIL ENGINEERING IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE DEGREE OF
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ABSTRACT

Earthquakes and blasts are generally considered as unlikely events by many professionals involved in the building industry. However, in many instances, such optimistic views are shown to be wrong at a great loss of human life and property. In many earthquakes and blasts, most of the deaths have occurred due to collapsing of buildings than due to any direct effect of the earthquakes or blasts.

Therefore, it is of primary importance to ensure that buildings will not collapse which requires a considerable enhancement in the ductility of the building. However, even properly designed ductile buildings can suffer extensive damage if there are certain undesirable features. Thus, it is suggested to include earthquakes and blast resistance principles at three different levels; those are the use of desirable structural forms, building planning provisions and the improvement of ductility through detailing. The steps that can be taken with respect to these three areas are investigated by comparing the desirable practices with those presently adopted. The methods for adopting such improvements to reinforced concrete buildings constructed in Sri Lanka are determined with case studies. It is shown that most of the measures taken to enhance the earthquake resistance could also enhance the blast resistance. However, some other measures would need a compromise. These compromising solutions are also adopted.

One of the primary reasons for not promoting earthquake and blast resistant construction by engineers and the clients is the cost involved. Therefore, the likely extra cost involved in adopting the recommended practices was determined. It is shown that the extra cost of adopting earthquake resistant details would be about 2 % of the total cost of the project. When blast resistance is also included, it would be about 2.5 % of the total cost. This indicates that it is worth adopting earthquake and blast resistant details for the government buildings such as administrative offices, schools, hospital buildings etc and also large public buildings such as supermarkets, banks, shopping malls, etc. built in future. Such measures would be useful in minimising the destruction and the economic loss that would occur in such events.

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It is my hope that the research presented in this thesis would be beneficial to many engineers and would serve a useful purpose.

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