

# Study on The Effects of Near-Field Earthquakes on Distribution of Shear and Moment Demands over Structures

## Abstract

The Northridge-94 and Kobe-95 earthquakes drew some of the building codes under question because of destruction of a noticeable number of new buildings which had been built according to new versions of the codes.

After much research and study the most probable reason of those destruction events was referred to special specifications of near-field earthquakes.

The near-field earthquake ground shakings are not a broad - band vibration and instead these shakings show pulse-like vibrations with strong long period amplitudes.

Such special characteristics result in specific effects on structural responses; some of the effects are: wave-like response instead of mode-like response, concentration of non-linear behavior in specific parts of the structure instead of spreading in the building according to current assumed patterns (e.g. Push-Over analysis), putting limitation on base-isolation methods for reduction of seismic forces, making supplemental damping more limited than usual, changing seismic forces distribution over the structure, .....

This thesis is oriented to verify what are the effects of near-field earthquakes on the distribution of maximum shear and moment demands through the structure.

The main parameter newly introduced by FEMA356 and can lead this study to its goals is DCR (Demand Over Capacity Ratio); therefore the final results of the calculations are related to DCR as a good parameter for describing capacity and demand together in one place.

Results show that the response is very sensitive to the  $T/T_p$  ratio (ratio of natural period of structure over governing period of ground shaking pulses). Also using only first mode of structure for representing the final response causes very under-estimated results specially in upper stories due to near-field earthquakes.