

DIMENSIONAL RESPONSE ANALYSIS OF STRUCTURES FOR RECORDS WITHOUT DISTINCT PULSES

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Abstract: The seismic response of two fundamental mechanical configurations of earthquake engineering, the elastic-plastic system and the pounding oscillator, is revisited with the aid of dimensional analysis. Starting from the previous work of the authors which concerned pulse-type excitations, the paper offers an alternative, yet most natural, way to present the non-linear structural response under excitations with arbitrary time-history. It is shown, that when the appropriate time and length scales of these arbitrary excitations are adopted, dimensional analysis can be implemented and remarkable order emerges in the response. Regardless of the acceleration level and frequency content of the excitation, all response spectra become self-similar and when expressed in dimensionless terms, resulting from dimensional analysis, follow a single master curve. The study proposes such scales (and pertinent selection criteria) among the available in literature strong ground motion parameters and proves that the proposed approach reduces drastically the scatter in the response.

Key words: Non-linear Structural Response, Dimensional Analysis, Earthquake Engineering.



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