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SOIL-STRUCTURE INTERACTION AND SITE RESPONSE AT THE JENSEN FILTRATION PLANT DURING THE 1994 NORTHRIDGE, CALIFORNIA, MAINSHOCK AND AFTERSHOCKS

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By C.B. Crouse and Juan Carlos Ramirez

Abstract

The effects of soil-structure interaction (SSI) and nonlinear site response (SR) on the Northridge mainshock and aftershock motions recorded at two buildings in the Jensen Filtration Plant, were investigated. Forced vibration tests conducted on the small one-story generator building and the larger three-story administration building, both of which recorded the mainshock and two aftershock sequences, revealed a prominent mode of vibration at 6.2 Hz in the short (EW) direction of the administration building. However, models of inertial SSI, calibrated to the vibration-test data, demonstrated that this phenomenon was of secondary importance, even when adjusted for nonlinear behavior of the soil and structure. Nonlinear SR and kinematic SSI were identified as the main reasons for the differences observed in the three sets of building earthquake records, each with clearly distinct amplitude and duration characteristics. Unfortunately, the absence of free field recordings at both buildings during the mainshock and first aftershock sequence prevented a clearer determination of the relative roles of these two phenomena. Fortunately, the installation free field instruments outside both buildings four years later revealed the significance of both effects, albeit at extremely small motion amplitudes. This case history further emphasizes the need to carefully plan the siting of ground-motion instrumentation so that the interpretations of any recorded data are not obscured by the potential effects of SSI.