

THE EFFECT OF VERTICAL EXCITATION ON STRUCTURAL RESPONSE SEISMIC CHARACTERISTICS

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ABSTRACT

Under an earthquake, structures might vibrate not only horizontally but also vertically due to a vertical excitation. Now the effect of the vertical excitation, however is not considered directly or with scientific Justification. The effect of vertical excitation must be studied to improve the seismic capacity of structures under real earthquakes. In this paper, the characteristics of vertical excitations are discussed comparing with horizontal excitations using 12 ground acceleration records including 1995 Hyogoken-nambu Earthquake records as the first step. As the results, these can be said that the maximum vertical ground acceleration is generally smaller than the horizontal, the vertical input energy due to earthquake is less than the horizontal, but the vertical response acceleration is larger than the horizontal, and the simultaneity of the horizontal and vertical response should be considered as the horizontal and vertical maximum response acceleration should occur at the same time.

1. INTRODUCTION

The earth would quake not only horizontally but also vertically under earthquake. Recently vertically high ground accelerations were recorded especially at sites close to the epicenter. For example, the horizontal and vertical maximum ground acceleration at the Northridge/San Fernando Valley Earthquake of January 17, 1994¹⁾ are shown in Table 1. A Vertical maximum ground acceleration is almost the same or bigger than the horizontal at some sites. Structures would vibrate vertically by this large vertical excitation, and additional varying axial force might act at columns due to the vertical vibration. So the restoring moment force of column would varies caused by this additional varying axial force.