

EARTHQUAKE DAMAGE AND THE AMOUNT OF WALLS IN REINFORCED CONCRETE BUILDINGS

by

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SYNOPSIS

From the analysis of the observed damage to low-rise reinforced concrete buildings around Hachinohe City in 1968 Tokachioki earthquake by evaluating the two parameters, wall area ratio and average shear stress in walls and columns, it is concluded that damaged and undamaged buildings could be significantly distinguished by these two parameters.

Based on the relation of earthquake damage to wall ratio and nominal shear stress in columns and walls, the probability distribution of the earthquake resistant capacity of existing buildings was estimated and the prediction of the extent of earthquake damage was made.

EARTHQUAKE DAMAGE AND WALL AREA

From the observation that, in the event of 1968 Tokachioki earthquake, most of the severely damaged reinforced concrete buildings had only small amount of walls, an investigation was undertaken on the relation between the extent of earthquake damage and the amount of walls in reinforced concrete low-rise buildings located in the eastern part of Aomori Prefecture, e.g., Hachinohe City and Misawa City, where damage to buildings were most severe. Most of the buildings investigated were three-story school buildings.

Nakagawa et al. made valuable investigation on the relation between damage and the amount of wall in reinforced concrete buildings for 1923 Kanto earthquake (Ref. 1). The analysis by the author differs from Nakagawa's approach in that it considers, in addition to wall amount, nominal average shear stress in the first floor columns and walls expected to have been experienced during earthquake.

Wall-Area Index, Column-Area Index and Average Shear Stress in Walls and Columns

Wall-Area Index : $A_w/\Sigma A_f$ (cm^2/m^2)

Wall-area index is defined as the ratio of the wall area in the first floor in a direction (transverse or longitudinal), $A_w(\text{cm}^2)$, to the total floor area above the ground floor, $\Sigma A_f(\text{m}^2)$. Reinforced concrete walls of which length are greater than 60 cm are all taken into consideration. For walled columns, the full areas of side walls are into account irrespective of their lengths.

Column-Area Index : $A_c/\Sigma A_f$ (cm^2/m^2)

Column-area index is defined as the ratio of the column area in the first floor, $A_c(\text{cm}^2)$, to the total floor area above the ground floor, $\Sigma A_f(\text{m}^2)$.

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