

10. Study on Structural Performance of Precast Reinforced Concrete Column using High Strength Materials

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Recently, high-rise RC buildings are often constructed with precast reinforced concrete members using high strength materials. Though a lot of studies have been carried out on structural performance of precast reinforced concrete members, there has been little study on structural performance of PCa columns in which high strength materials were used and high axial force was applied. Therefore, in this study for high-rise buildings of 30-40 stories, loading tests were carried out on PCa columns and structural performances were examined.

The following findings were obtained.

- 1) When lateral reinforcement of $p_w \sigma_{wy} = 9 \text{ N/mm}^2$ ($p_w \sigma_{wy} / \sigma_B = 0.11$) or more was arranged, the deformation capacity was about $R=1/25$ to $1/40$ rad, and enough deformation capacity was supplied regardless of difference of axial force ratio. Moreover, the shapes of the Q-R curves were spindle type which are excellent in energy absorption capacity.
- 2) The difference of the smoothness degree (ruggedness) on the connection of the bottom of the column had little influence on the amount of slippage in the horizontal direction of the bottom of the column.
- 3) Although calculated values of flexural strength obtained by the ACI equation occasionally estimated experimental strength values to the dangerous side, the calculated values by the NZ equation estimated experimental values to the safe side. Though calculated values of shear strength by the equation of design guidelines for earthquake resistant reinforced concrete buildings based on inelastic displacement concept (AIJ equation) estimated experimental values to the dangerous side, when effective yield strength equation of New RC design guideline was used as the yield strength of lateral reinforcement, the calculated value of the AIJ equation estimated experimental value to the safe side.
- 4) A correlation was found between the deformation capacity R_u and the dimensionless quantity of the amount of lateral reinforcement $p_w \sigma_{wy} / \sigma_0$ on PCa columns. Moreover, the already proposed simplified deformation capacity evaluation was found to also be applicable in the evaluation of deformation capacities of PCa columns.

Key words : precast, reinforced concrete, column, high strength material, structural performance