Seismic Performance Evaluation of Hybrid Post-Tensioned Precast Concrete System through Numerical Analysis

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ABSTRACT

This study develops numerical models for hybrid post-tensioned precast concrete systems using the OpenSees program and evaluates their seismic performance. The models were developed and validated against previously conducted tests on hybrid post-tensioned precast concrete frame specimens, considering the unbonded reinforcement ratio as a variable. Based on the developed models, parametric studies were conducted on the unbonded reinforcement ratio affecting the structural and seismic performance of the system, through which the behavioral characteristics of each case were identified. From these findings, simplified models were proposed using a material model that incorporates degraded hysteretic behavior, along with a set of characteristic parameters that effectively capture key cyclic response features. The simplified models were subsequently applied to simulate hybrid post-tensioned precast concrete prototype structures subjected to ground motions. Their seismic performance was also compared to that of a reinforced concrete system. The results indicate that the post-tensioned precast concrete system can achieve acceptable seismic performance as specified in current structural codes.

REFERENCES

Kim, J.H., Lee, D., Choi, S.H., Jeong, H., and Kim, K.S. (2022), "Seismic Performance of Precast Multi-Span Frame System Integrated by Unbonded Tendons", *ACI Str. J.,* **119**(5), 193-206.

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