

Yoshida Award: Research Paper Category

Experimental Study on Seismic Behavior of Anchorages Embedded in Reinforced Concrete with Flexural Cracks

Journal of JSCE, Ser. E2 (Materials and Concrete Structures), Vol. 76, No. 3, pp. 209-228, 2020.

Abstract available at the following link:

https://www.jstage.jst.go.jp/article/jscejmcs/76/3/76_209/article/-char/en



Seiji Nagata

Central Research Institute of Electric Power Industry



Toyofumi Matsuo

Central Research Institute of Electric Power Industry



Hironori Morozumi

Kansai Electric Power



Keizo Otomo

Central Research Institute of Electric Power Industry

Reinforced concrete structures often support important components, including intake pumps and pipes, in installations such as emergency cooling systems for reactor cores in nuclear power plants. These structures must retain support capacity when the plant is damaged, even in a major earthquake. If cracks occur in the base concrete around anchorage points, there is a concern that the anchorages may have reduced strength and altered dynamic characteristics. However, existing verification methods are based on few investigations because anchorages fall between the scope of the civil engineering and mechanical engineering fields.

The authors tackled this boundary issue and investigated the complex seismic behavior of anchors in the presence of concrete cracking based on static and dynamic experimental methods. The findings of their research were used in *Guideline and Recommendation for Seismic Performance Verification of Underground Reinforced Concrete Structures in Nuclear Power Stations 2021*, which gives rational assessment methods for seismic performance verifications. It includes such practical recommendations as “it is of no matter in the seismic performance if the damage level of concrete members is lesser than yielding of the main reinforcement in the case of bolt yielding failure mode of the anchors”. The paper also presents valuable findings related to the post-earthquake assessment of damage by vibration measurements and to repairing cracks using epoxy resin. There are high expectations that these methods will be collaterally utilized in the maintenance stage of structures.

For the above reasons, this paper is recognized as being a worthy recipient of the Yoshida Award in the Research Paper Category.