# **Department of Architecture**



# Seismic Performance of RC Columns Using Round Steel Bars as Longitudinal and Additional Bars Shogo YAMAMOTO

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 Reinforced Concrete Structure, Seismic Structure

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 RC Column, Cyclic loading, Bond Behavior, SHCC

Background and Purpose

- In the Specifications for Highway Bridge Part V Seismic Design (2017), the suggestion of the new technique to improve of deformation performance in the RC columns at the time of an earthquake is needed.
- In this study, cyclic loading tests and fiber model analyses were performed to investigate the seismic performance of RC columns using round steel bars as longitudinal and additional bars.

### Using round bars as longitudinal bars

- Maximum strength of φ6 model which were fully scaled agree well with D6 model. Improvement of the deformation performance is shown in φ6 model compared with D6 model.
- From analysis results,  $\varphi 6$  model may behave perfect bond. Early strength drop of  $\varphi 9$  model used lager diameter longitudinal bars is caused by the unbonding of round steel bars.

### Using round bars as additional bars

- Repair performance of SHCC which shows spalling restraint effect by short fibers is investigated.
- Damage area is controlled by using additional bars to perform multiple repair tests.
- Repaired models used round bars and SHCC show the improvement of deformation performance while controlling the maximum strength.



### Approach in the future

- The most appealing point of this study is using round steel bars as additional bars which can control the strength by early unbonding between steel bars and concrete.
- RC columns which minimize residual displacements will be proposed by using ultra high strength steel bars which shows the early unbonding as longitudinal steel bars.