기술논문

Effects of the Replacement Length of Concrete with ECC on the Cyclic Behavior of Reinforced Concrete Columns

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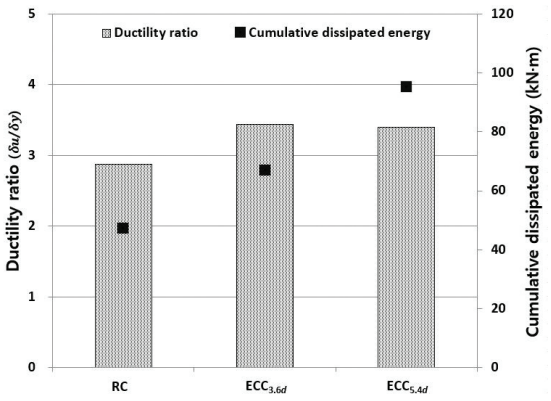
This paper presents an experimental investigation on the effects of the replacement length of concrete with engineered cementitious composites (ECC) on the cyclic behavior of a reinforced concrete (RC) column. An RC specimen and two types of ECC specimens with different replacement lengths of concrete with ECC were fabricated and a series of cyclic load tests was carried out. From the test results, the following conclusions were drawn:

1) In the RC specimen, as the lateral displacement increased after the maximum load, the load decreased drastically. Local damage was also observed, such as spalling of the cover concrete near the plastic hinge on the length of 1.0d from the column-base joint, and buckling of the longitudinal reinforcing bars. In comparison to the RC specimen, ECC specimens exhibited effective prevention of shear cracks and spalling of the cover concrete, and the buckling of longitudinal reinforcement was not serious. Excellent tensile properties of the ECC, such as strain hardening behavior and multiple micro cracks, led to a minimization of spalling of the cover concrete by controlling flexural and shear cracks in the plastic hinge zone of the column.

2) In the case of the ECC specimens, the ductility ratio of the RC, $ECC_{3.6d}$, and $ECC_{5.4d}$ specimens were 2.88, 3.44 and 3.40, respectively. Although the ultimate displacement of the ECC specimens increased with an increase in the L_R, all ECC specimens exhibited a similar ductility ratio. This means that the effect of L_R on the ductility ratio is not significant. The increase of the ductility ratio of ECC specimens is mainly due to tightly controlled bending and shear cracks in the plastic hinge zone. This resulted in an increase of displacement of ECC specimens at the yielding.

3) The energy dissipation capacity was improved up to 101.3% higher than that of the RC specimen. Based on the results of this experiment, it is recommended that the replacement length of concrete with ECC from the column-base joint is considered to be more than 3.6d at the plastic hinge region of an ordinary RC column.

[Fig 1] Ductility ratio and cumulative dissipated energy for each specimen



※ 원본출처

01. Hyun, J. H., Bang, J. W., Lee, B. Y., & Kim, Y. Y. (2021). Effects of the Replacement Length of Concrete with ECC on the Cyclic Behavior of Reinforced Concrete Columns. Materials, 14(13), 3542.