10. Structural Experiment of Reinforced Beams using Strain-hardening Cementitious Composites

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Recently, a core wall structure for high-rise apartment buildings is being developed to enable free planning and increase residential spaces. In this multistoried building, the connecting beams of the core walls have short spans, and thus the deformation angles will be large under high stresses, such as during an earthquake. The short-span beams were decided to be not ordinary beams but strain-hardening cementitious composite (SHCC) beams, which have high strength and high deformation capacity. In this study, the basic structural performances of the SHCC beams were experimentally investigated.

The following results were obtained:

1) A large number of small cracks not exceeding 0.2 mm developed on the SHCC beams, but the SHCC cover did not exfoliated, and the damage was slighter than that to RC beams.
2) The Q-R curve of the SHCC beam was stable until R = 1/20 rad (plasticity ratio of 7 to 10). The hysteretic energy absorption was larger than that of RC beam.
3) The flexural strength value calculated using the ACI equation and the value of sectional analysis were 20% to 30% on the safer side from the experimental flexural strength value of the SHCC beam.
4) An equation was developed by modifying the shear strength equation of the Seismic Design Guideline of the Ultimate Strength Type Structures so as to consider the increases in tensile strength by PVA fibers. The equation could estimate the shear strength of SHCC beams on the safer side almost correctly.

Key words : strain-hardening cementitious composites, SHCC, beam, loading test, structural performance