

10. Development of Reinforcement of R/C Beam with an Opening at Beam-End Region

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An opening for pipe ventilating installation must be established in beams of multiple dwelling houses of reinforced concrete (R/C) construction. When the opening is established at the beam-end region, it is known that inappropriate reinforcement methods for openings cause brittle fractures in an earthquake, from past research. Therefore, openings at beam-end region were not allowed. The opening is instead established in the region that separates the beam depth from the column surface and the pipe is run outside. A large drop ceiling for storing the pipe is required which puts a large constraint in the living space plan.

For the purpose of enabling the opening to be established at beam-end region, opening reinforcement was devised, and beam performance was examined by loading test. The result confirmed it to have strength and deformability guaranteed by the design, and this design method is able to be proposed. In addition, the full-scale construction experiment result showed that there was no problem in workability of installation of reinforcement and repletion of concrete in the vicinity of opening.

Key words: reinforced concrete, reinforcement for opening at beam-end region, strength, deformability, workability