10. Aging Deterioration of Natural Rubber Bearings Installed in the Base-isolated Building - Mechanical Properties of Natural Rubber -

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Laminated rubber bearings were first used to seismically isolate buildings about 30 years ago. Assessments of the aging of these bearings require long-term tracking surveys. In a previous study, we performed static loading and free vibration tests on a seismically isolated building for 30 years after its completion.

This paper describes and presents the results of material tests of rubber sheets cut from laminated rubber specimens. We performed both tensile tests of rubber excised from the specimens and shear tests of pieces excised from the adhesive joints between the rubber and steel plate. Using laminated rubber bearing specimens exposed to the same conditions, we also investigated changes in horizontal stiffness caused by aging. We found that the hardness, tensile stress, and shear stress of the rubber sheets in the outermost 30 mm periphery exhibited relatively significant aging effects compared to the inner area of the bearing. We found that aging-induced changes in horizontal stiffness of the rubber bearings removed from the building was slightly greater than the changes identified in the previous tests of the building. Overall, changes attributable to aging over the course of 30 years were within the range assumed at the design stage.

Key words: base-isolated building, natural rubber bearing, aged deterioration, material test