Study On Mechanical Properties Of Large Rubber Bearings

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Recent years, the application of seismic isolation technology has gain great interest in China. More than 8,000 base isolation buildings were built in the past decade. On September 1, 2021, China promulgated the Management Regulations on Seismic Resistance of Construction Projects, requiring that eight types of new and renovated buildings located in high intensity areas and key seismic surveillance and defense zones should adopt seismic isolation or mitigation. Meanwhile, a series of mega seismic isolation projects using rubber bearings with 1400mm and 1500mm diameter were applied in China, for instance, Beijing Daxing International Airport, Kunming Changshui International Airport, Xichang ChuanTou Hospital, etc. With the implementation of the Regulations, projects demand large rubber bearings with high performance more extensively. Yet the mechanical properties of such bearings, especially the tests, were rarely studies in previous research.In this paper, the mechanical properties of 1400mm and 1500mm diameter bearings were studied experimentally. The vertical compression performance, horizontal shear performance and horizontal ultimate shear performance (400% strain) of large diameter bearings of LRB and LNR were tested, with 4 types and 16 specimens in total. The specimens performed well with no damage under most tests except that, the LNR1400 bearing showed local debonding of rubber and steel plate under the horizontal ultimate shear test. The test phenomenon and data demonstrated that the bonding of rubber and steel plate is critical to the horizontal shear performance of the bearing, and ultimate shear performance. The hysteretic energy dissipation, vertical compression stiffness, vertical deformation performance, horizontal equivalent stiffness, equivalent damping ratio, post-yield horizontal stiffness, yield force and horizontal ultimate deformation capacity of the large diameter bearing were compared and analyzed according to the test data. The results indicated stable performance and satisfying energy dissipation capacity of the specimens. The variances of the test parameters were less than 15%, and the horizontal ultimate shear strain exceeded 400% required in Chinese codes. The data was of great value in understand large rubber bearings` mechanical properties. This research also provided an important test basis for standardizing the inspection and testing of large rubber bearings.