

7. Development of Passively-Controlled Rack for the Automatic Warehouse - Combination of Damping Devices and Results of Earthquake Observations -

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In the storage racks for automatic warehouse, earthquake countermeasure system is required, for the sake of the protection of the storage loads and the business continuity. The authors have developed a passively-controlled rack system with damping device units which are composed of rolling bearings and viscous dampers beneath the rack column bases of one line of a pair of rack units connected with top beams. Previous report showed the system had high damping effect on the rack under the various placement of the loads. This paper presents a newly developed sliding bearing for the purpose of cost reduction and the applicability of the system to existing racks. To verify the damping effect on the response acceleration of the system installed newly developed sliding bearing, the shaking table tests were carried out. The results of the tests showed same damping effect on the response acceleration, as compared with that on the system using the rolling bearings. And more, passively-controlled rack system was installed in the warehouse building at the Technical Research Institute of Okumura Corporation, and earthquake response observation was implemented. The damping effect of this system was confirmed based on the earthquake observation records.

Key words: Automated storage racks, vibration damping construction, vibration testbed testing, seismic response analysis, seismic observation