

Self-centering Aseismic System with Elastic Bearings and Hydraulic Dampers

The theoretical and experimental analyses emphasize the following features of the proposed system:

- self-centering of the building after an earthquake;
- the undulatory seismic energy in the building is constant and about 1% of the weight, by using bearings with sliding friction (pure Teflon). This is negligible if bearings with rolling friction (steel balls) are used. Moreover, it is independent from the seismic frequency and the soil displacement;
- the vertical seismic energy in the building is minor and it increases both with the increase in the ratio between the frequencies (phase opposition) and with its decrease (phase);
- the building remains almost motionless (negligible displacement) with respect to the horizontal translation of the foundation-soil complex for all values of the direction angle of the motion, of the soil displacement and acceleration;
- in an interval of emergency vertical seismic frequencies, including the resonance frequency, the dampers are started up automatically. They progressively decrease the dynamic strain of the springs, which are integral parts of the bearings;
- because of the sub-undulatory shock, the total load on the bearings increases for upward soil displacements and decreases for downward movements, under both phase and phase opposition conditions.