Input 1 Earthquake protection

There are many problems with specifying what effects earthquakes will have on structures, not least of which is the nature of the vibrations – wavelength and amplitude – and the geological state of the foundation on which the structure is built. The latter can be critical in determining the survival of the structure, such as in San Francisco, where structures built on sand alluvial deposits near the bay collapsed quickly in the 1987 earthquake because the foundations became fluid when vibrated. Similar effects are frequent in Japan, such as in the Kobe earthquake (1994).

Some protection of the structures themselves can be created by using bearings at the foundation, so that the vibrations are damped or absorbed. A popular choice for such bearings is simply massive blocks of rubber interleaved with sheets of steel to control the compressive stiffness while leaving the shear modulus unaffected (**Figure C1** shows a bridge bearing). Indeed the material is so good at damping high frequency, low amplitude vibrations it has been used to mount buildings over railways so as to inhibit transmission of the vibrations to the occupants (**Figure C2**). The same design can be used to protect civic buildings against earthquakes (**Figure C3**).

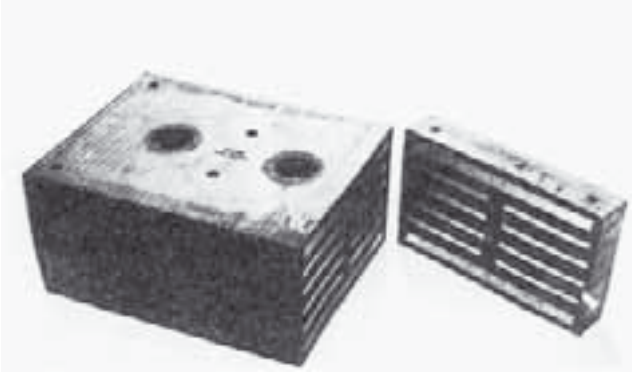

Figure C1 Typical bridge bearing

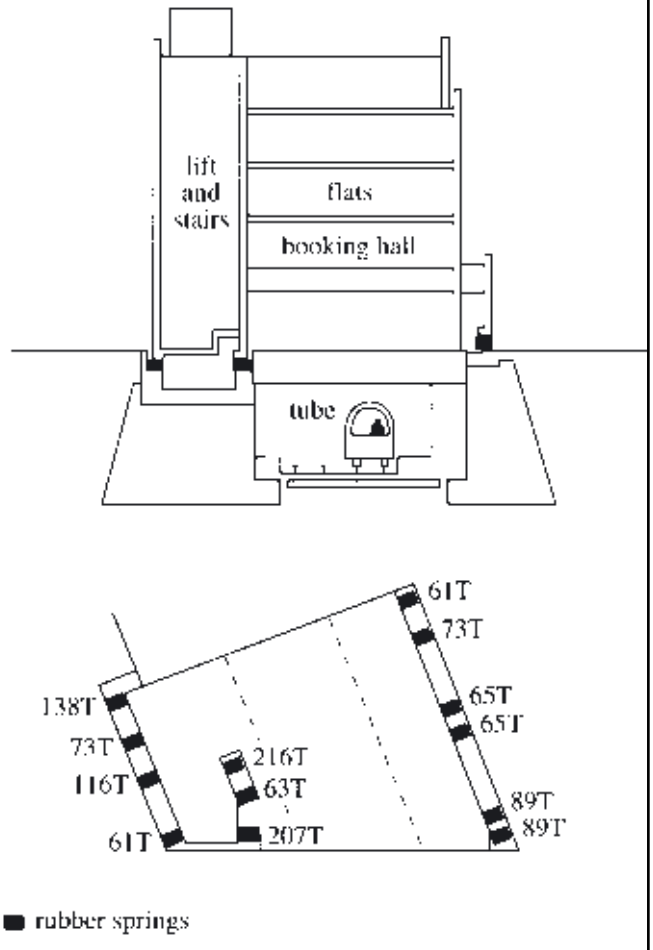

Figure C2 Positions of building bearings

Figure C3 Bearing for a building in earthquake-prone regions