Special Feature 2

Supplying Safety and Peace of Mind to the World via Innovative Seismic Isolation and Damping Systems

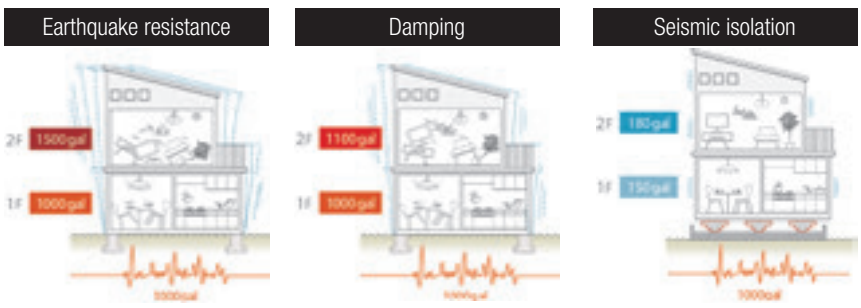
Earthquake Resistance, Damping and Seismic Isolation

The Great East Japan Earthquake disaster of March 11, 2011 prompted heightened social awareness of the importance of effective earthquake countermeasures. In regard to earthquake protection initiatives that are applied to buildings, there are three types of technologies—earthquake resistance, damping and seismic isolation. Earthquake resistance refers to a structure engineered to primarily improve the ability of pillars and beams to withstand seismic force. In this approach, the full force of an earthquake is conveyed to the ground floor, with the shock then amplified as the force rises to the second floor, third floor and above. Damping refers to a structure which incorporates damping systems with dampers to lower earthquake energy and reduce shocks. This approach is effective in high-rise buildings and other structures. Seismic isolation refers to a structure in which seismic isolation systems are set up between buildings and their foundations, eliminating direct transmission of earthquake shocks to buildings by effectively separating them from the ground. Among these three technologies, the seismic isolation structure manifests the highest results in controlling earthquake shocks, with THK seismic isolation systems contributing to the move to seismic isolation in various types of buildings.

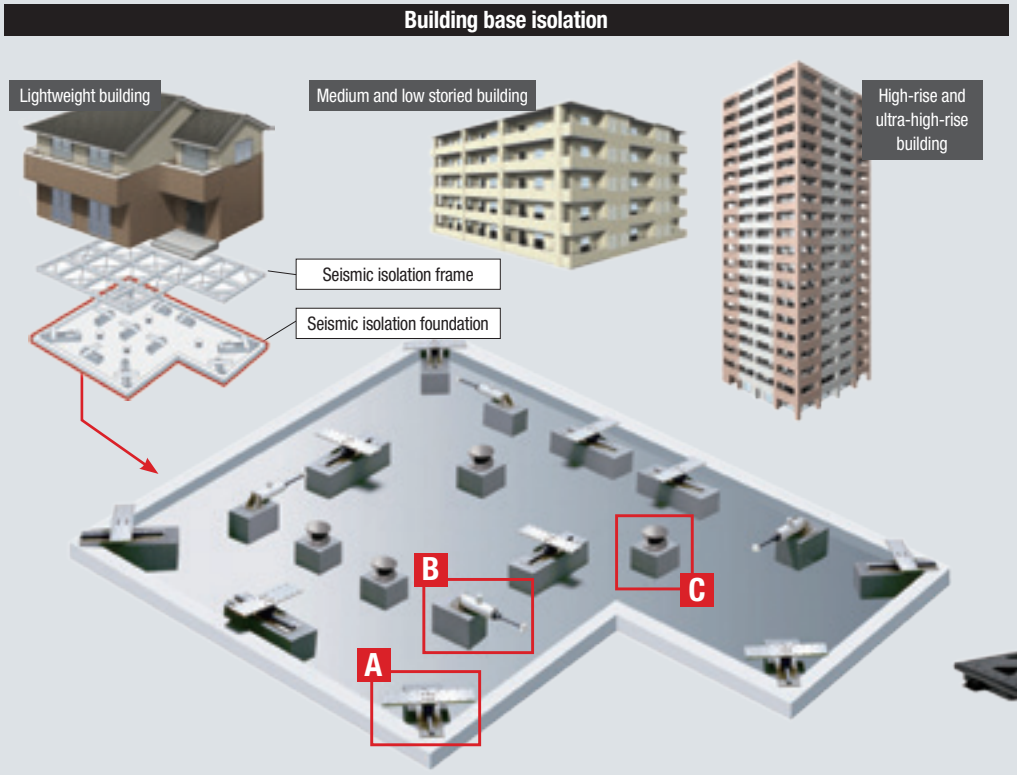
The Superiority of THK Seismic Isolation and Damping Systems

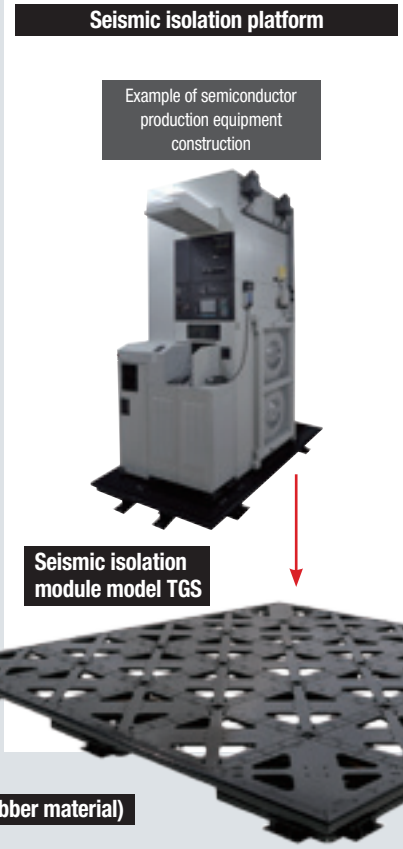
With the seismic isolation structure, which is comprised solely of laminated rubber, the scale of buildings enabling the shift to the seismic isolation approach is limited to those from about four to five stories to a maximum of 10 stories high. With low-rise buildings one or two stories above ground, the small load does not allow the laminated rubber to manifest its full strength, therefore no seismic isolation effects are realized. With high-rise buildings, meanwhile, because the intensity of the pull-out force upon the occurrence of an earthquake increases with the height of floors, it is insufficient to fully withstand the pull-out force with laminated rubber.

This dilemma was resolved with THK seismic isolation systems. The structure of THK isolation systems is comprised of crosswise combinations of LM guides. Because LM guides have low coefficients of friction and can easily move all



Gal is a unit of speed (cm/sec^2) and one indicator used to measure the magnitude of earthquakes. Acceleration due to gravity ≒ 980 (gal).
The Kobe Marine Meteorological Observatory indicated that maximum acceleration of the Great Hanshin-Awaji Earthquake in 1995 was North-South 818 gal.
* Acceleration data in the above diagrams are rough estimates. Figures will differ depending on the structure of the building and magnitude of the earthquake.
* The location of load bearing walls as well as seismic isolation and damping systems provide a conceptual image and differ from actual conditions.





types of objects, it becomes possible to achieve seismic isolation in low-rise buildings. Moreover, the strong pull-out force renders the shift to seismic isolation possible in high-rise buildings as well, clearing the way for the use of seismic isolation in a broad range of applications.

THK also supplies the market with viscous damping systems. Damping is primarily a technology used to respond to long-period seismic motion in high-rise buildings. Long-period ground motion refers to earthquake tremors that are large and extended in cycle. While such long-period ground motions have hardly any impact on low- to medium-rise buildings, in high-rise buildings resonance occurs and the shocks are large and continue for extended periods. The conventional damping systems were classified into two categories—steel types and viscous types. The viscous types are distinguished by greater energy absorption as the speed increases. THK damping systems, comprised of viscous types, use ball screws to convert earthquake shocks from linear motion to rotary motion. That serves to amplify the speed, with energy absorption from the viscous bodies growing larger and making it possible to control seismic shocks to a greater degree than with conventional products.

The Expanding Potential of THK Seismic Isolation and Damping Systems

Against the backdrop of heightened awareness of the importance of effective disaster countermeasures, demand for THK seismic isolation and damping systems is expanding. Reflecting increased recognition of the importance of Business Continuity Plans (BCPs), attention is particularly growing with regard to seismic isolation platforms to protect servers and various types of manufacturing equipment from seismic shocks. To address that need, the Seismic Isolation Module, Model TGS, was marketed in fiscal 2011 as a new seismic isolation platform. Along with the addition of a damping function to the preceding model, broad latitudes in connectivity make it possible to mobilize seismic isolation platforms across a broad range of applications. Model TGS was honored with the 54th 10 Major New Products Awards sponsored by Nikkan Kogyo Shimbun Ltd. Furthermore, developed in April 2012 was the Inertial Rotary Damping Tube (iRDT)—a new viscous damping system designed for use in controlling the shock range of long-period ground motions in high-rise buildings.

Today, concerns are being voiced about the likelihood of a major earthquake striking directly beneath the Tokyo metropolitan area, as well as three hypothetically linked earthquakes in the Tokai, Tonankai and Nankai regions of Japan. In this regard, demand can be expected for seismic isolation and damping systems from government offices to ensure that they are capable of serving as emergency disaster response headquarters as well as from hospitals when disasters occur. With regard to seismic isolation platforms in particular, an area in which further growth in demand is forecast, THK will be advancing spirited efforts to expand its sales for super-precision machinery and various other types of industrial machinery, while also pioneering overseas markets for its products.

THK will continue to develop and energetically increase sales of seismic isolation and damping systems from here on as well, striving to contribute to society by supplying safety and peace of mind when it comes to earthquakes.