



Installing Machinery in Earthquake Zones: Anchor or Isolate?

A risk assessment is one of the first things that should be done when planning the installation of machinery in an earthquake zone. If you are not sure whether your plant is in an earthquake zone, check with your local building commissioner, city engineer, or planning and zoning administrator. Protecting your personnel and business from earthquakes should be your primary concern. Licensed contractors and professional engineers and architects should be consulted early in the design and planning stages of the project.

The application of vibration and shock isolators has been proven to be extremely beneficial in protecting buildings and equipment from the devastating effects of earthquakes. However, the structure of a building and a machine is quite different. In addition, buildings have much lower system natural frequencies than do machine tools. These differences need to be taken into consideration in the design and application of vibration and shock isolators.

Vibro/Dynamics Isolators contain design features that have proven effective in protecting machinery from earthquakes with low to medium magnitudes. Earthquakes produce varying deflections at frequencies from 0.5 to 30 Hz. Unlike buildings where most earthquake damage is due to low natural frequencies that excite the building structure; machinery is susceptible to damage when subjected to higher frequency vibration and the twisting forces caused by horizontal displacements and foundations that move or fracture.

Vibro/Dynamics Elastomeric Isolators, particularly the larger MXL Series, have low horizontal stiffness and are designed to provide the horizontal displacement necessary to dissipate forces and to protect your machine. See Figure 1.

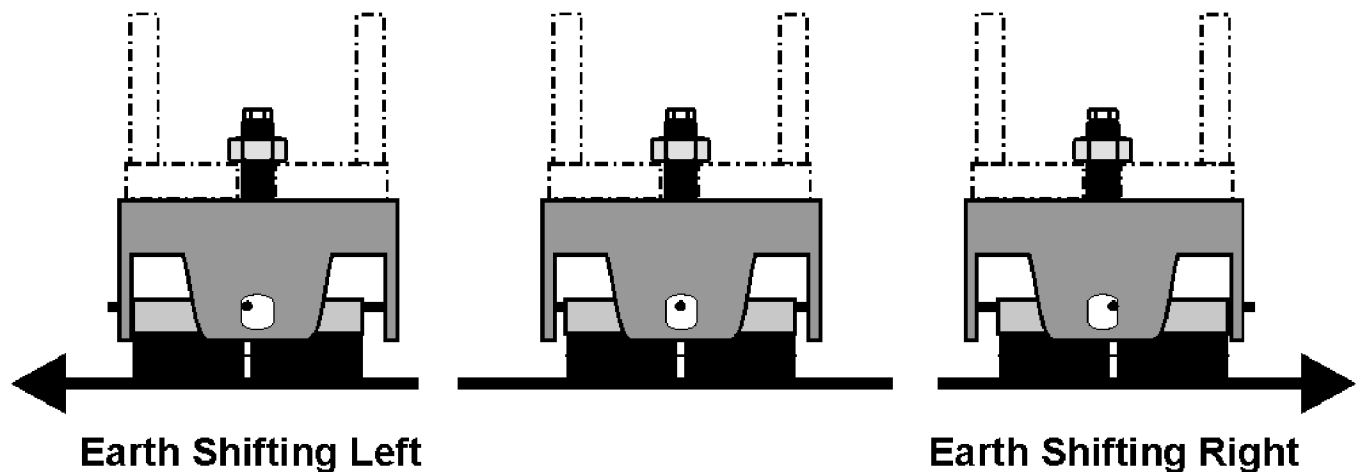


Figure 1

Technical Bulletin MIL 694

Horizontal displacement and low horizontal stiffness are made possible with our patented Glide/Damping System design that reduces the transmission of the high-intensity horizontal shock waves from the foundation to the machine. These horizontal shock waves can be particularly harmful to presses that are bolted down. Vibro/Dynamics Isolators also feature a swiveling capability that allows at least a two-degree tilt between the foundation and machine foot, further reducing stress to the machine structure. See Figure 2.

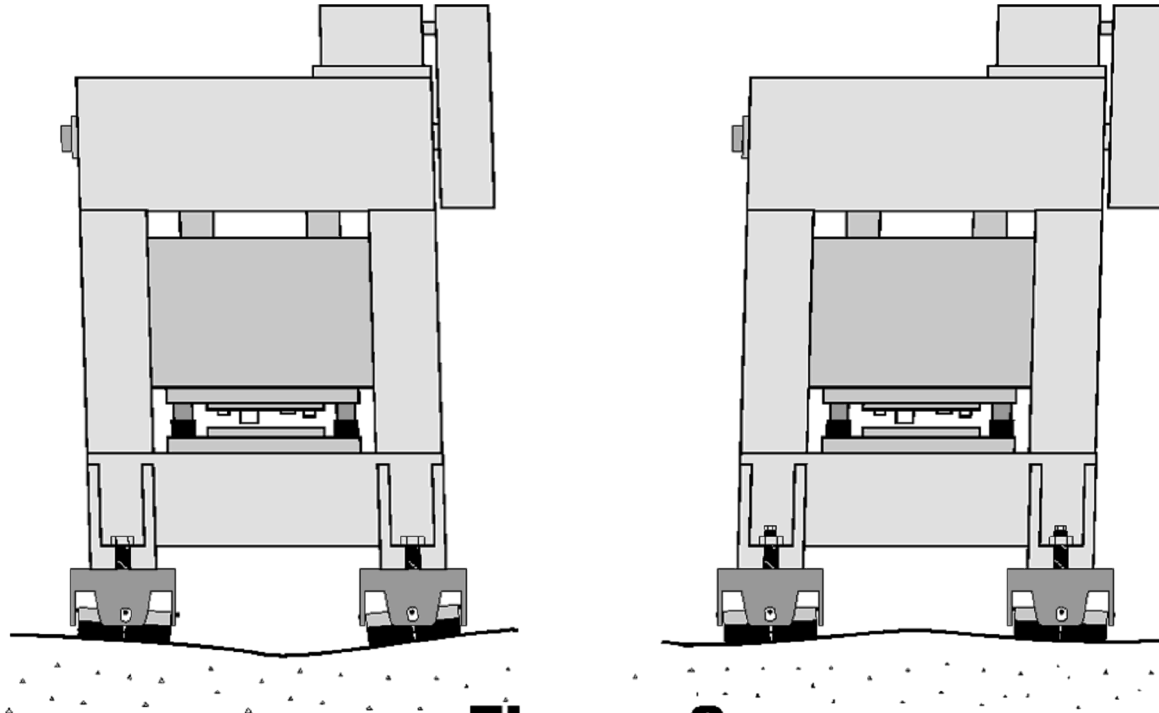


Figure 2

Vibro/Dynamics offers the following installations as evidence that this machinery installation approach is effective in protecting machinery from earthquakes.

- After an October 1, 1987 earthquake in Los Angeles, that had a magnitude of 6 to 6.6 on the Richter scale, we contacted several of our customers in the area close to the epicenter. At that time there were more than 60 presses mounted on Vibro/Dynamics Isolators in two plants. We learned that none of the machines installed on our isolators were affected in any way by the earthquake. Presses ranged in size from 35 to 150 tons. None of the presses had any sign of damage. None of them tipped over, and all of them performed as well after the earthquake as they had before the earthquake. One of these manufacturing plants was close enough to the epicenter to encounter physical damage to the building.
- Contrary, we learned of a press that was bolted down in another building that had performance problems after the same earthquake. Within days after the earthquake, the press required considerable structural repair work. The shock from the earthquake was apparently transmitted directly into the press frame, causing it to be forced out of parallelism, flatness, and alignment due to the anchoring of the machine to the foundation.
- Shortly afterward, another earthquake occurred in Puebla, Mexico. A large automotive “B” press had been installed and leveled on VIBRO/DYNAMICS Isolators two months before that earthquake. The machine was checked carefully and it was found that it was still precisely level and aligned.

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No one can predict the magnitude of future earthquakes and their devastating effects. There are simply too many factors. No one can guarantee that machines will remain standing in earthquakes that have extreme magnitudes, whether they're anchored down or on isolators.

Vibro/Dynamics does not believe that anchoring a machine to its foundation will guarantee that it will remain upright, nor would we guarantee that a machine mounted on Vibro/Dynamics Isolators would remain upright or not incur any damage after large magnitude earthquakes.

There are over 200,000 machines mounted on Vibro/Dynamics Isolators throughout the industrialized world, many in countries that routinely experience earthquakes. Yet, we have never heard of a case where a machine on our isolators has tipped over, collapsed, or suffered decreased performance as a result of being through an earthquake.

In any event, we cannot guarantee that a machine mounted on our isolators will not be affected by earthquake. After severe earthquakes, we recommend that any press, isolated or bolted, be checked for level, flatness, and gib clearance. We believe that machines mounted on our isolators will hold flatness, parallelism and alignment better than machines that are bolted down. We know that if a machine loses flatness, parallelism or alignment as a result of an earthquake, or for any other reason, that it is much easier, faster, and more economical to correct the condition if it is mounted on Vibro/Dynamics Isolators.

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