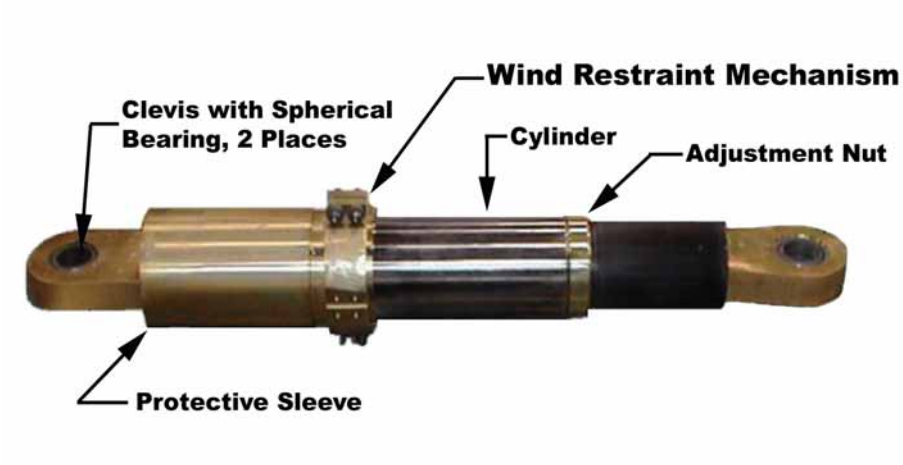
Dampers With Wind Restraints

Wind Restraints:

Virtually any Taylor Damper or Lock-Up Device can have a mechanical element added to prevent the Damper from stroking during wind events or any other vibration that results in low level forces.

Simple, yet effective, this feature can prevent stroking of the Damper at forces up to 25% of the rated force for the Damper or Lock-Up Device. Since the forces that result from wind events are typically less than 25% of the earthquake force, the wind restraint restricts the Damper from stroking, while allowing it to function as a typical Damper during a seismic event.

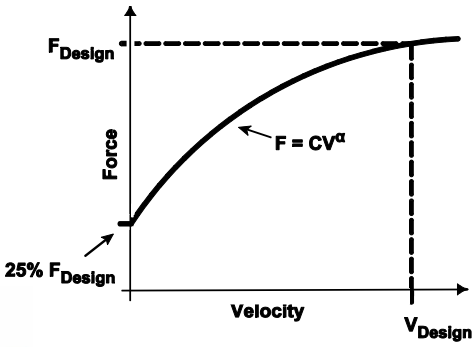


Damper Diagram Showing Wind Restraint

When used together with Dampers and rubber bearings as part of a base isolation system, this feature can prevent unwanted movement of the building caused by wind.

This type of device is also useful for very flexible buildings where it is desirable to have the Damper act as a rigid link with chevron or diagonal bracing elements to provide stiffness for wind events while providing damping for seismic events.

Taylor Devices' Wind Restraint Devices are custom-made devices, with the same basic dimensions as our Fluid Viscous Dampers, but include a small bolt-on mechanism. Available in force ranges of 10 kip to 2000 kip, with stroke capability of up to 120 inches.



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Project Example: South Bay Office Tower

In most structural applications, the steel or concrete frame of a building prevent the building from moving enough to engage the Dampers. The only time that the building has sufficient displacement to stroke the Dampers is during moderate to large earthquakes.

In some special cases, we encounter a structure that is very flexible or has a unique design that allows significant movement during wind events. Prior to the development of the wind restraint, Dampers that were installed in these buildings for seismic protection would be continuously stroking during wind events. Although the small amount of damping that is provided during wind storms may be desirable in some cases, there are other instances where the engineer prefers to have Dampers act as a rigid link during wind events. One such case is the South Bay Office Tower located in San Jose, CA.

Built around 30 years ago, this building is very unusual as the steel frame metal floor decks are hung on straps from two reinforced concrete towers. This permits the floors to sway back and forth very easily. The floor suspension system is similar to a pendulum and the floors can sway anywhere from three to five inches before they hit solid structure.

Located at 3031 Tisch Way in San Jose, CA, the South Bay Office Tower is one of several buildings to use a suspended floor system.

As you might expect, a floor system this loose has severe problems with wind excitation. So fragile steel bumper bars were installed to prevent wind sway. These bars restrain the floor movement under normal wind excitation. They were designed to break and permit floor motion in an earthquake.

The bumper bar system turned out to be inadequate for present day requirements. After extensive analysis, Saiful-Bouquet, the structural engineer, developed a concept to remove the bumper bars and replace them with viscous Dampers. This brought the building into compliance with present standards.

In order to prevent wind sway, it was now necessary to add a wind restraint to the Dampers. After extensive experimentation, Taylor Devices developed a band type friction clamp that performed well and had very little drift under the loads associated with wind. This type of wind restraint can provide restraining force up to 25% of the rated force for a Damper. Since the force developed in the Dampers as a result of wind is typically less than 10% of the force that is produced by the maximum credible earthquake, a wind restraint set at 10-15% of the rated force is typically sufficient to prevent the Damper from stroking. An additional benefit of this type of restraint is that it is reusable after an earthquake, unlike a yielding restraint that must be replaced after an earthquake. The wind restraint also retains its setting after decades of inactivity, and allows the device to act as a typical Damper during a seismic event.