

The World's Most Famous Mass Damper

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Marvels of engineering have always drawn crowds. But when we think of tourist destinations, we think of old, opulent buildings like the Vatican or Versailles, massive, elaborately designed fountains, or skyscrapers like Chicago's own Sears Tower (no, I will not call it the Willis Tower).

These are all buildings designed with prestige, not practicality or profit, in mind. A skyscraper is actually more expensive to build than two buildings of half its height, but there's prestige and fame in being the tallest, and people have proven time and again that those less tangible benefits are worth pursuing.

So when we think of a tourist attraction, we're more likely to think of a skyscraper itself than a giant tuned mass damper—a plain engineering practicality—inside of it. But that's exactly what Taipei 101's tuned mass damper, a 728-ton steel orb suspended from five stories of steel cable, has become. It's got informative placards, voice tours and everything.

It certainly helps that Taipei 101 is already a famous skyscraper on its own. It had been the tallest skyscraper in the world until it was outstripped by the Burj Khalifa in 2010. It also used to have the world's fastest elevator and is still the largest "green" building in the world. But the supertall tower's mass damper has become a centerpiece of sorts for the building in the same way many skyscrapers' observation decks are.

Gawkers aside, the mass damper's primary function is obviously an engineering one. Tuned mass dampers are devices developed to reduce mechanical vibrations in buildings such as skyscrapers. When a skyscraper starts blowing in the wind, Taipei 10's mass damper works as a counterweight, gently rolling on hydraulic cylinders to counteract and reduce the building's movements from forces like the wind. It's just one of the many ways skyscrapers are designed to provide a flexible frame that won't be damaged by everyday stresses.

The mass damper in Taipei 101 has to contend with more than just the wind, however. It's just 660 feet from a major fault line, and earthquakes are a significant threat. And a few years back, the mass damper was given its greatest test in the form of Typhoon Soudelor, which moved the damper an entire meter from its resting position, the farthest it's ever been pushed. Through it all, Taipei 101 has remained



Tuned mass damper on display in Taipei 101. Photo by Armand du Plessis (CC BY 3.0)

standing, earning it the title of "world's toughest" building by *Popular Mechanics* almost exactly three years ago in no small part because of its mass damper.

Usually, most construction elements such as this mass damper would be hidden away from sight. There's even a pair of far less accessible dampers in the same building that are tucked away in the tip of its spire. But the designers purposely left the shaft the main mass damper hangs down open, making the mass damper freely visible from all five of the floors it dangles past. While every other one of the building's bones are hidden, this single one is laid bare, a small engineering marvel for curious onlookers.

The mass damper is so popular that it even has its own mascot: Damper Baby. The little mascot was developed by Sanrio, the Japanese company of *Hello Kitty* fame. Aside from , its torso is the mass damper itself. All in all, it kind of looks like a sort of bee person, or at least the yellow version does. The mascot even comes in five colors and provides both decoration for the damper's immediate surroundings and something to line the shelves of Taipei 101's gift shops.

The skyscraper's mass damper is curiously popular enough to almost be labeled an icon, and is irreversibly connected to the image of one of the world's famous modern supertall skyscrapers, all while still doing its job of maintaining the stability of said skyscraper. It's an impressive bit of work, so if you ever find yourself in Taiwan, be sure to visit it and check out a modern power transmission engineering marvel. **PTE**