

**Description of Innovation:** A post-tensioned concrete shear wall can be simply described as a conventional concrete shear wall in which about 50% of the vertical reinforcing bars are replaced with an equivalent amount of high strength cable that is tensioned after the wall is constructed. The addition of the post-tensioned cables modifies the design, detailing, and behavior of the wall as follows:

1. Allows the mild steel reinforcing to yield during a seismic event yet has sufficient restoring force to bring the wall back to plumb following the seismic event. Simply put, the wall will self-center.
2. The yielding of the mild reinforcing steel during a seismic event provides added damping to the structure improving its performance.
3. Increases the overall stiffness of the wall improving seismic performance.
4. Allows the engineer to set the performance level of the structure by controlling the drift limits via the amount of post-tensioning used.
5. Reduces mild steel congestion improving construction efficiency.

**What the innovation is and why it is innovative:** Replacing mild steel reinforcing with post-tensioned cables in a concrete shear wall allows a building to self-center following an earthquake. Conventional reinforced concrete shear walls will not self-center once the rebar yields resulting in a building with permanent inter-story drift following an earthquake.

**Where and when it originated, has been used, and is expected to be used in the future:** The concept was developed at Tipping Mar and first used to seismically strengthen an existing seven story concrete building located in Berkeley, CA in 2005. Since that time, the system has been used as the lateral bracing system in four buildings and will be used in a fifth building which has not yet started construction. We believe the system will become an industry standard in earthquake prone areas and used in many future buildings.

**What it changed or replaced:** The post-tension concrete shear wall will replace the conventional concrete shear wall in earthquake prone areas in many instances, depending on the height and scale of the building.

Sheet 1: Innovation Illustration

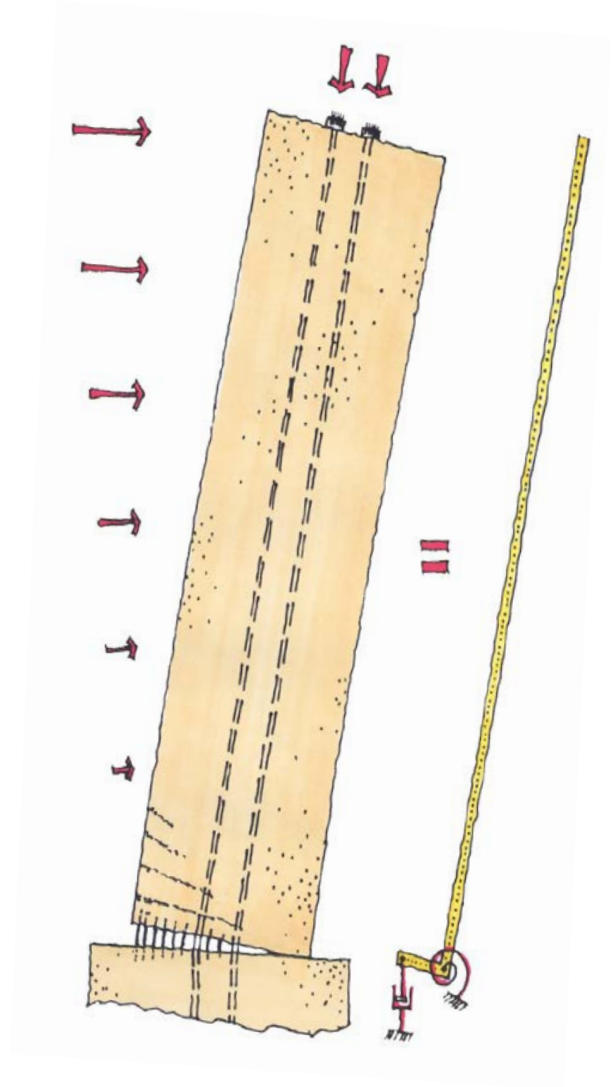
**PT Concrete Wall**

Traditional cantilever wall combined with un-bonded post-tensioning

Combines elastic spring and yielding damper

*Hybrid advantages:*

- Self-centering response
- Reduced rebar congestion
- Stronger and more compact
- Tough and damage resistant



**TIPPING | MAR**