Aikido Anchoring

By George Porter

Aikido is one of the most sophisticated martial arts. It is used only in self-defense and uses the force of the attacker to create the power to subdue the opponent. The techniques provide effective defense against an unprovoked attack by one or even several adversaries. The art is thousands of years old and is very efficient.

Tie Down Engineering has apparently found a way to use these same principals to create an entirely new anchoring system for manufactured housing. I have seen the test data and a video of a supervised test in Florida and I have to admit I don't fully understand exactly how it works. However that's OK because I don't completely understand how Aikido works either, but it certainly does.

The system consists of an ordinary looking soil anchor, (although somewhat shorter in length than traditional anchors) some special plates for under the piers and some 2x4's and 4x4's. At first glance you will notice that the anchor is installed normally near the perimeter of the home and the strap goes to the top of the main beam on a 45 degree angle. Then you see that the strap is not connected to the beam, it just passes over it then straight down to plate under the pier, then back up over the beam to the anchor. How does this work when it is not clamped to the beam? How does holding on to the bottom of the pier help?

The system is called Vector Dynamics and not only does it work, tests in North Carolina and Florida have shown that it more than doubles the holding power of the anchor making less than half the quantity of anchors necessary. There are very involved mathematical formulas that can explain why but in simple terms it uses leverage. Just as you can use a lever to make moving something easier you can use it to make moving something harder. Let's suppose you had a pry bar four feet long and you wanted to pick up a heavy box with it. First you would place the end of the pry bar under the edge of the box and then you would put a 2x4 or something under the bar as close to the box as you could get it and push down on the other end of the bar. If the box was not too heavy and the force was enough on the end of the bar the box would lift up. The critical item here is the placement of the 2x4. This creates a mechanical advantage. If 10% of the bar is on the box side of the 2x4, then 90% is on the side that is used to push down. This is a 9 to 1 mechanical advantage. This means that for every 100 lbs of push you will get 900 lbs of lift on the other end of the bar.

Now let's turn this around. Let's suppose we are the box and we want to lift the person pushing the bar. Now we have a 9 to 1 mechanical *disadvantage*. This means that in order for us to lift 100 lbs of person we will have to use 900 lbs of force. This leverage can multiply the force in either direction depending on the pivot point of the bar.

In the Vector Dynamics system there is a 2x4 between the anchor head and the block pier. The 2x4 acts as a lever between the base of the pier and the anchor making it much harder for the pull on the straps to move the anchor. Still don't understand? I don't either but it works.

One more example

Take a 6 foot 2x6, a piece of rope, and a concrete block and try a little experiment. Tie the rope on the block, stand back away from it so when you hold the rope it is coming off the block at a 45

degree angle, like an anchor strap. Now pull the rope and see how hard it is to lift or move the block. You will find that it is not hard at all. Now tie the rope to the end of the 6 foot 2x6 and set the concrete block on top of it next to the rope. Place your foot against the other end of the board and pull the rope at the same 45 degree angle so you are trying to lift the other end of the board with the concrete block on it, it is a lot harder. In fact I did this same experiment with a 5 lb barbell weight, a 6 ft. board, rope, and a fishing scale. It takes 5 lbs of pull to pick up the 5 lb. weight alone but it took 10 lbs of pull to lift the board with the weight on it.

This pulling at an angle causes some of the force to be directed back to your foot and you can feel it. That's what this new anchoring system does too. Some of the force is pushing against the base of the pier, the harder he home tries to lift up, the tighter the pier stack becomes because the strap is squeezing the blocks tighter together. This squeezing force is distributed through the foundation stabilizer plates of the Vector Dynamics System

This is a greatly oversimplified explanation but it's the best I can come up with without getting into rocket science. It really does use the force of the attacker (the wind) to help keep the home on the ground, just like Aikido.