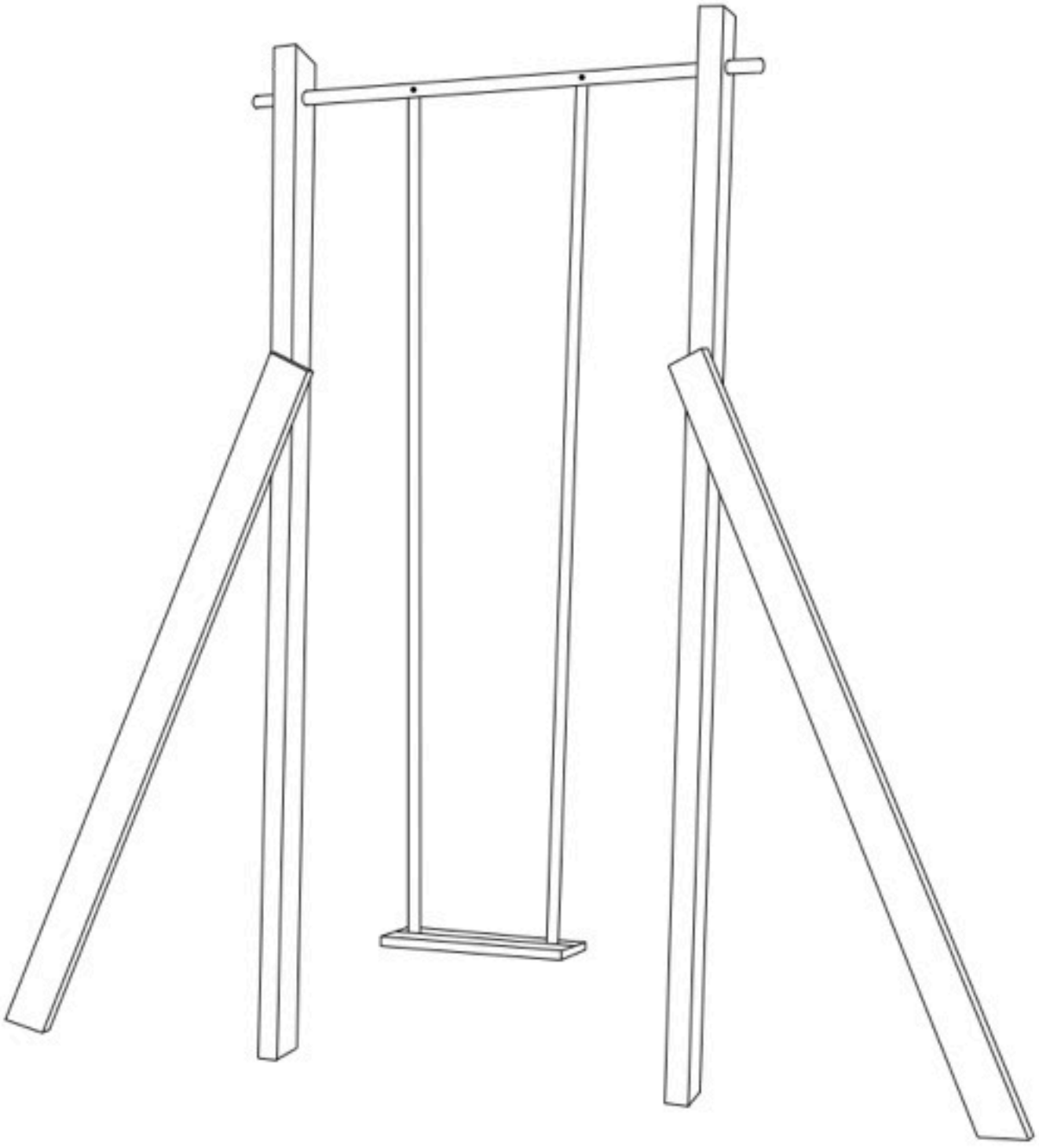
Mega Swing



Safety Manual

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When people see the Mega Swing, some may think that it is “unsafe” or “dangerous.” However, it has been designed very carefully and thought out extensively to ensure that it is as safe and reliable as possible. This manual is provided to address any rider’s/viewer’s concerns and answer any questions they may have. Although the Mega Swing may be designed to be as safe as possible, there are some common sense rules that people need to follow in order to make sure no one is injured.

1. **Do not stand in the path of the swing while someone is riding.**

2. **Do not ride unless both foot harnesses and both hand straps are secured.**

3. **Do not ride unless you feel you are physically capable of doing so.**

The Mega Swing measures 12’ from the top of the concrete footings to the top of the main wood columns. It measures 11’-6” from the top of the concrete footings to the top of the swing at its resting position, and 21’-6” to the top of the swing when it is at its highest position. The two main wood columns are No. 2 Douglas Fir 4x6s. Each one is anchored to an 18” square x 18” deep 4,000 psi concrete footing with a USP steel G185 post base (Figure 1). Each main wood column is supported by four guy wires. Each guy wire is 1/4” diameter 7x19 steel cable (Figure 2), rated for a safe working load of 1,400 lbs and a breaking strength of 7000 lbs.

Figure 1 - USP Steel G185 Post Base

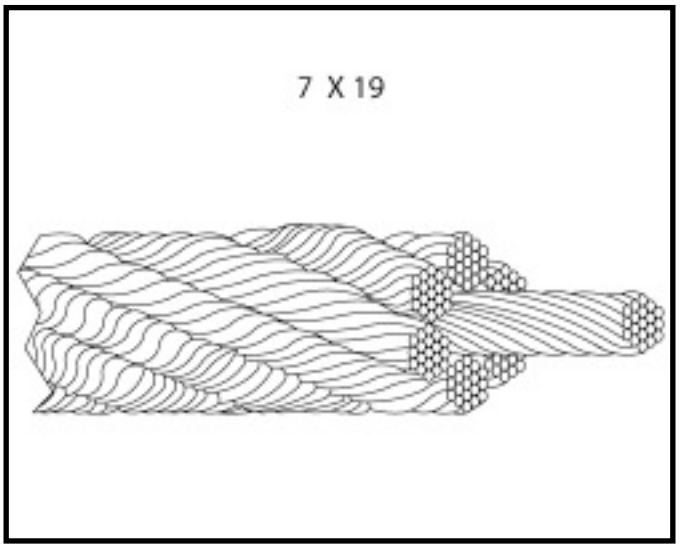

Figure 2 - 7 x 19 Steel Cable

The guy wires are anchored to the ground with a helix earth anchor(30” long and 4” helix diameter) designed to withstand to 2,500 lbs each (Figure 3). There are two anchors on each side of the swing with a total strength of 5,000 lbs on each side.

Figure 3 - 30-4 Helix Anchor

The two arms of the swing are constructed of 10’ pieces of 1” diameter galvanized steel tube connected to a 2” diameter galvanized steel tube with 1/2” diameter Grade 2 bolts with a shear strength of 27 ksi. (Figure 4)

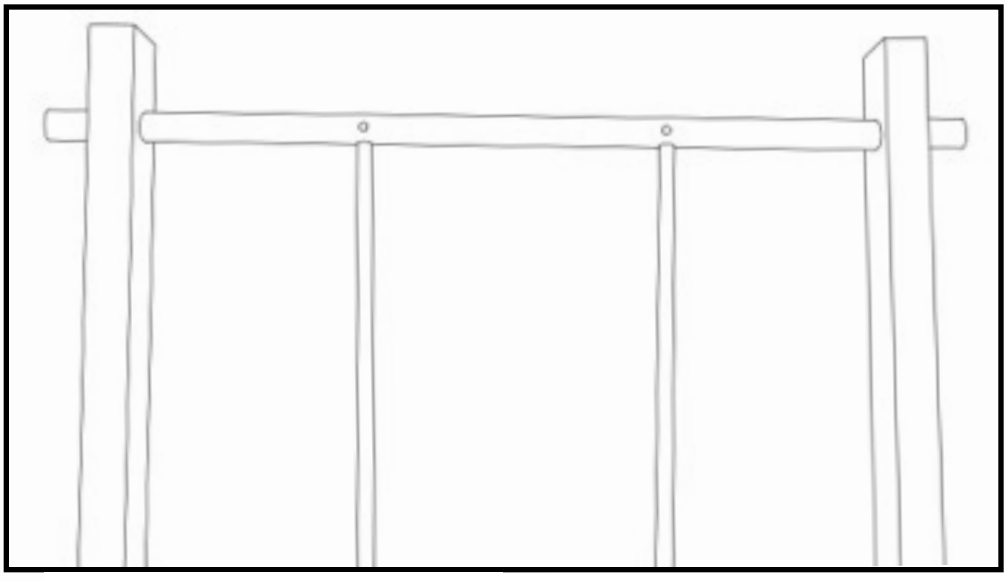

Figure 4 - The top section of the swing

To keep the Mega Swing from moving laterally, there are two 10’ No. 2 Whitewood 2x6s (figure 5). Each one is embedded approx. 18” into the ground with a 2x4 nailed perpendicularly at the bottom to keep it from pulling up. (Figure 5)

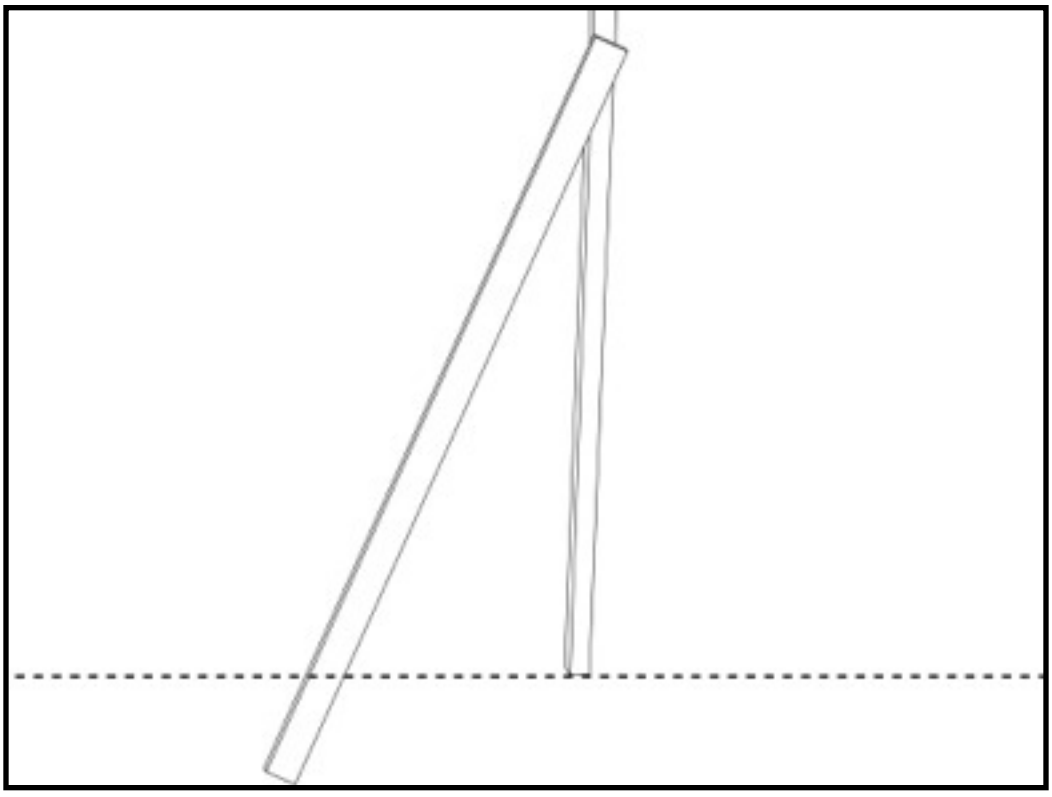

Figure 5 - The 10’ 2x6 goes approx. 18” into the ground.

Now that we have seen how much force the main components of the Mega Swing can withstand, let's see how much force a rider on the swing is actually exerting. For the purpose of this manual, the force at the very bottom of the swing will be calculated since this is where the most force is exerted.

As the swing goes around in a circle, it is constantly accelerating towards the center of the circle. That means that there is a force pulling towards the center of the circle. In the case of the Mega Swing, the two arms are pulling you towards the middle and this force is called centripetal force. (figure 6)

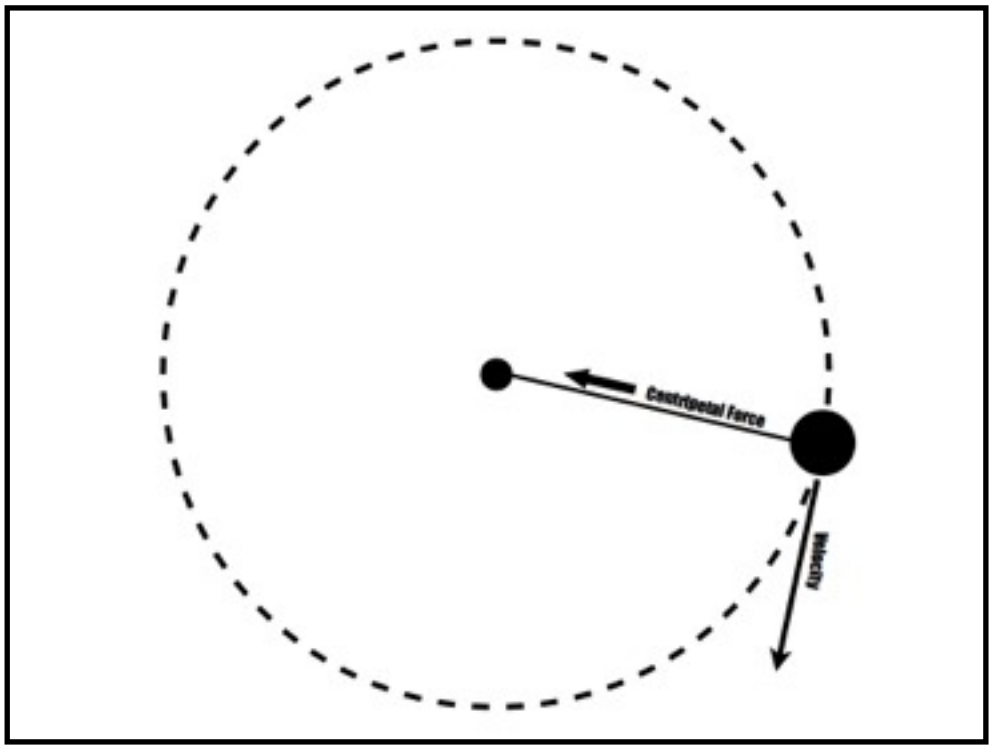

Figure 6

In order to find the centripetal force, we can use Newton's second law of motion:

$$\mathbf{F = ma}$$

At the bottom of the swing, there are two types of accelerations acting on the swing: centripetal acceleration and the acceleration of gravity. The acceleration of gravity on Earth is 9.8 m/s^2. In order to find the centripetal acceleration of the swing, we need to use the formula v^2/r. The maximum velocity of the swing at the bottom is conservatively estimated to be 11 m/s based on measurements taken. Therefore, the centripetal acceleration can be calculated as follows: v^2/r

$$\frac{(11 m/s)^2}{3.048\ m} = \frac{\frac{121 m^2}{s^2}}{3.048\ m} = \frac{121 m^2}{3.048\ m \cdot s^2}$$

$$\mathbf{= 39.7\ m/s^2}$$

Now that we know both of the accelerations, we can use the formula $F=(mg) + (ma_c)$. Let's say that the rider's mass is a maximum of 90kg (approx. 200 lbs).

$$\mathbf{F = (90kg \cdot 9.8m/s^2) + (90kg \cdot 39.7m/s^2)}$$

$$\mathbf{F = (882N) + (3{,}573N)}$$

$$\mathbf{F = 4{,}455\ N}$$

So if someone with a mass of 90kg (approx. 200 lbs) rode the Mega Swing and was going 11 m/s at the bottom of the swing, they would be exerting 4,455 N of force on the swing. One Newton is equivalent to 0.225 lbs.

$$4{,}455N \cdot .225\ lbs/N = \mathbf{1{,}003\ lbs}$$

Because this is distributed over two columns, each column has a maximum load of only **502 lbs.** This means that the structure is more than strong enough to support the force of the swing.

Even though the Mega Swing is strong enough, a rider may not anticipate the forces and fall off the swing while it is in motion. That is why there is a safety harness system for the Mega Swing.

Before any rider begins to swing, they will be securely fastened by both of their feet and both of their hands (Figure 7). Even if a rider were to pass out and lose consciousness, they would still be safe due to the harness.

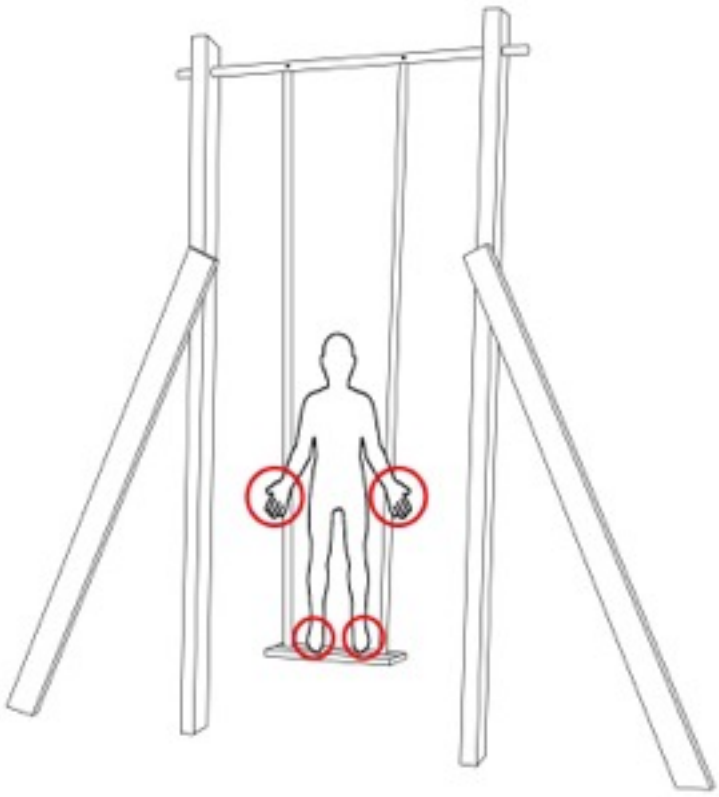

Figure 7 - Both hands and feet are secure.

The straps of the harness are made of 1" tubular nylon webbing (Figure 8). The webbing has a minimum breaking strength of 4,000 lbs.

Figure 8 - A spool of 1" tubular webbing

On each foot, the straps are wrapped around the ankles tightly and tightened towards the front. Each strap then comes up in between the middle of the two planks and crosses over the foot to the back of the platform(Figure 9). This ensures that the foot won't fall out or move forward or backward.

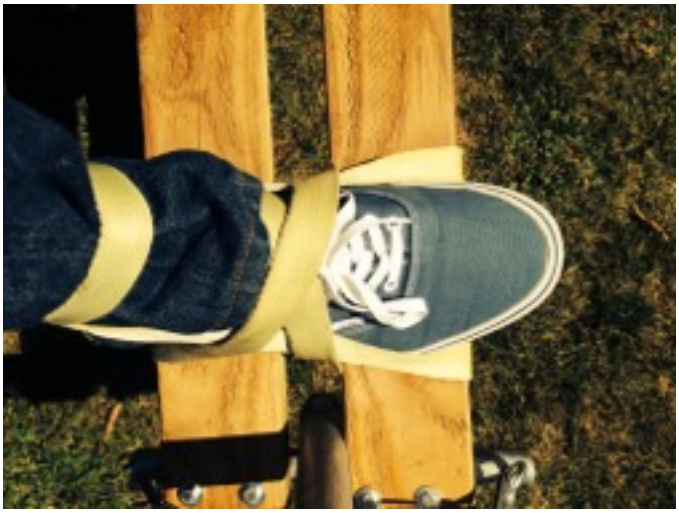

Figure 9 - Foot harness

The straps are then run through an eye screw(Figure 10) to tighten them and then securely tied off with a knot called the “Sheet Bend” (Figure 11). The “Sheet Bend” knot is a very strong knot designed to securely attach two ropes together.

Figure 10 - eye screw in swing.

Figure 11 - The sheet bend knot.

The hand straps are made of short pieces of tubular webbing tied in a loop with the “Bowline” knot. The hand straps are then securely looped around the poles and the hands are inserted into the loop. The rider then twists the webbing until the loop is tight around their hand(figure 12).

Figure 12 - Hand strap

FAQs

Q: "*Are you sure you won't hit that bush?*"

A: Yes, I'm sure.

Q: "*What happens if someone sneaks in at night to ride it?"*
A: I lock it with a chain and padlock at night.

Q: "*How in the world do you get all the way over?"*

A: Squat and lean back towards the bottom of the swing. Stand up and pull forward at the top.

Q: *"Did you just use EMT conduit for the arms?"*

A: No. The tube I used for the arms is much thicker and stronger.

Q: *"Where did you buy the cable?"*

A: eBay

Q: *"Why don't you wear a helmet?"*

A: There isn't really anything for you to hit your head on.