

IAAPA Attractions **EXPO**

Climbing Wall Systems: An Essential Safety Guide

Wednesday, November 15, 2006
4:30 PM to 5:45 PM
Room # B409



CLIMBING WALL SAFETY MANUAL

Extreme Engineering, the creator and patent holders of the mobile climbing wall and auto-belay systems, has made this safety manual composed of safety tips, maintenance logs, and additional information to assist you in operating and maintaining your climbing wall product. Also included is a CD which contains contact information on all the safety inspectors in the US. This information was composed by the Consumer Products Safety Commission. This safety manual has previously been used by customers, vendors, and state inspectors worldwide. **Please visit Extreme Engineering's booth, number 1649, and ask about our fantastic show specials.** For additional information on Extreme Engineering's products please contact us at 916-663-1560 or visit our website at www.extremeengineering.com.

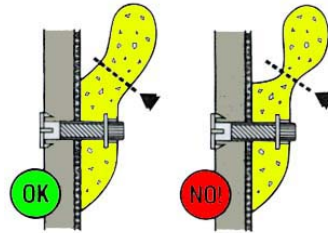
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WHY HANDHOLDS BREAK

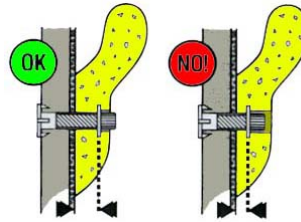
Over-tightening, uneven wall surfaces, previous damage, ultra-violet degradation, excessive force, and use of an incorrect bolt can all cause a hold to break. While most hold breakage occurs during installation, holds can also break when in use. The route setter has the responsibility to inspect each hold for potential problems before installation. It is important to select holds that are designed to sustain the intended load without breakage. Extreme Engineering offers the largest selection of HRT climbing holds that are designed for mobile and stationary climbing holds. HRT climbing holds are simply the best on the market! For example:



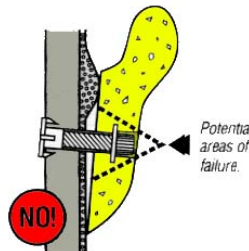
“Holds with thin cross-sections need to be thick enough to bear the expected weight.”



“Center sleeves should be tall enough to prevent failure behind the washer or in the center sleeve area.”



“Make sure the threads of the bolt and T-nut are clean, and that the T-Nut is perpendicular to the wall.”



Washing holds will remove chalk build-up and excess shoe rubber, and will also restore the original texture. Wash holds in a mild detergent, ether with a nylon brush or in a dishwasher.

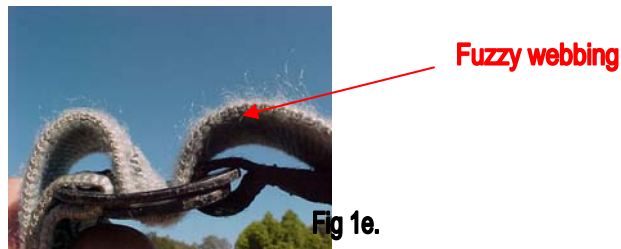
TYPES OF CLIMBING HARNESSES

1. UV Damage

Ultraviolet light can be one of the worst kinds of damage on a harness because it is hard to convince the harness owner that fading is a problem. The good news is that it is easy to spot. Discoloration and general fading indicates prolonged exposure to the sun. Virtually every modern harness is made up of UV-sensitive polymers. These polymers and threads lose much of their strength with prolonged exposure to sunlight.

2. Webbing Condition

It applies as in point 1. but in addition to UV damage wear is a huge factor. Most webbing exhibits “fuzz” near the buckle areas making it extremely difficult to adjust properly, see Fig. 1e. Any rips or cuts cannot be tolerated. To properly retire a climbing harness the harness should be cut into small pieces then disposed.



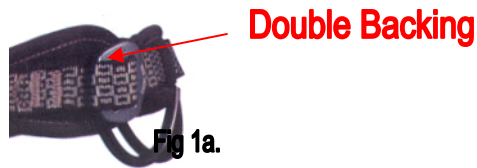
3. Tread Conditions

Key stitching around the tie in point and leg loops must be in excellent condition. **NO LOOSE THREADS!**

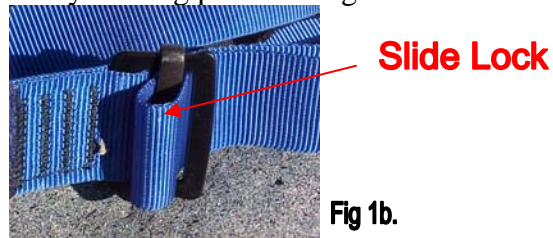
4. Buckle Condition

There are four basic buckle types used on harnesses today:

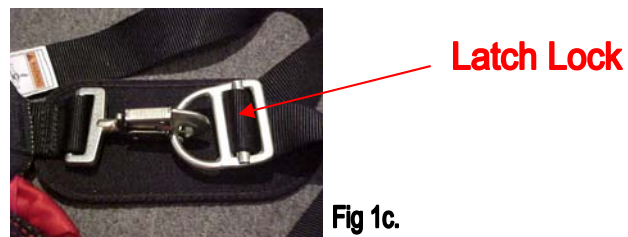
1. *Double Backing*. This buckle requires the climber to double back the end of the webbing back through the initial loop for additional safety measure (Fig 1a.).



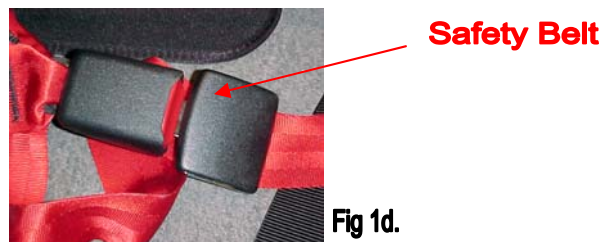
2. *Slide Lock.* These harnesses are the most common fully adjustable harness available. The buckle is made of two independently moving parts that tighten under tension (Fig 1b.).



3. *Latch Lock.* This is the most secure style and is used on the more upper end harnesses. This lock has a double latch that prevents accidental openings (Fig 1c.). Extreme Engineering offers the Speed Harnesses™ which use the latch lock for quick and safe use. The Speed Harnesses™ are the most popular harnesses used today for high cycle use. Contact Extreme Engineering to order your Speed Harnesses today!



4. *Safety Belt.* This style comes in a variety of styles. Only the slide type passes side impact while under tension. This is what I recommend (Fig 1d.).



5. Size and Type

There are two basic types of climbing harnesses: a three-point harness (seat harness) and a five-point (shoulder harness).

- a. Three point. This style goes around the waist and legs, three points.
- b. Five point. This style goes around the legs, waist and over the shoulders, five points.

Three point harnesses are by far the most common style. When worn properly it is extremely effective. The waist belt must be worn above the hips and below the rib cage. Leg loops keep the belt from ridding up. When small children climb with small hips a 5-point should be used.

6. Proper / Improper installation

For three point harnesses the waist belt must be above the hips and below the rib cage. If the harness is worn below the hips it will not secure the climber properly in the event of an upside down fall. The leg loops are there to merely keep it from riding up too high.

CARABINER INSPECTION

1a. Styles

Carabiners come in a variety of styles. For our application we need to focus on the self-locking type. The part of a carabiner that opens and closes is called the gate. The gate can have a variety of locking devices:

- 1. *Screw gate* (Fig 1f.)



Screw gate

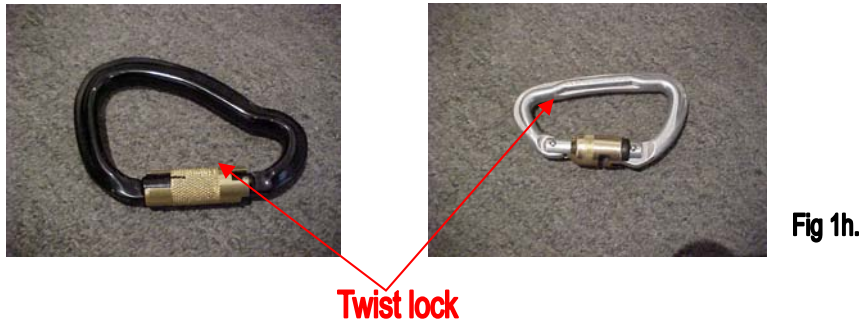
Fig 1f.

- 2. *Ball lock* (Fig 1g.)

Ball lock



3. *Twist lock* (Fig 1h.)



All configurations, but the ball lock, require the operator to manually close the gate to lock it in place. Extreme's preference is always the twist gate for its ability to safely automatically lock when released.

1b. Notching

Everything will wear out (third law of thermodynamics). When the body of the carabiner is worn to excess it will have a groove or notch at the inside of either end. The notch will dramatically affect the tensile strength of the carabiner. Any visible grooves are immediate cause to retire the carabiner. See (Fig 1i.) below.



1c. Fractures

Failure to replace carabiners when worn can result in massive fractures or breakage as seen in (Fig 1j.) below.



Fig 1j.

Fracture

REPLACING YOUR AUTO-BELAY CABLES

Auto-belay™ cables should be replaced before 10,000 or every year (12 calendar months from the date of purchase), which ever comes first, even if there are no signs of wear.

Step 1



First release all the pressure out of the tank.

Step 2



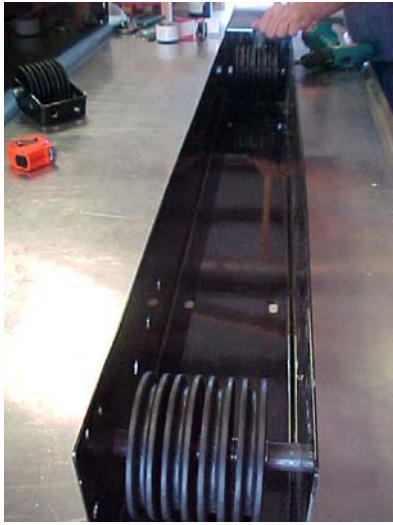
Loosen all the bolts on the lids of the box.

Step 3



Using a ratchet, drill, or a wrench, loosen and remove all bolts. Please make sure you save all the bolts!

Step 4



After the bolts are removed, place them in a safe place and remove the two lids.

Step 5



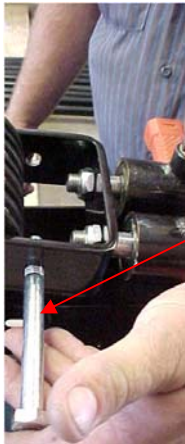
Pull up on the rams so that they are standing out of the box.

Step 6



Brace the rams in place with some sort of solid bar such as a hammer, crowbar, a piece of wood, etc.

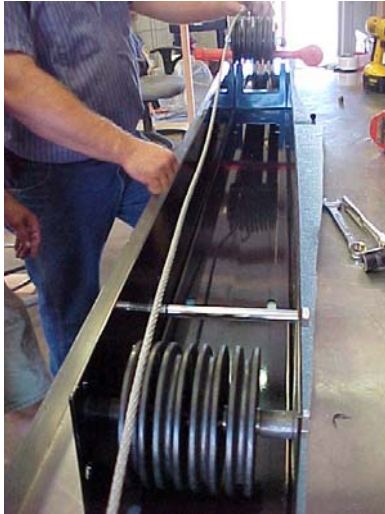
Step 7



Pin or bolt (depending on model)

Loosen and remove the bolt or pin (depending on model) so that the Auto-belay™ cable can be placed around the pulleys. Make sure to place parts in a safe place.

Step 8



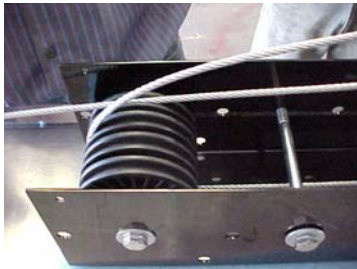
From the front end of the Auto-belay™ box, start placing the cable through the pulleys starting from the left side first. (Note: you will have 3 to 5 pulleys depending on your Auto-belay™ system).

Step 9

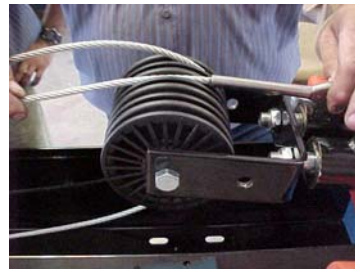
1a.



1b.



1c.



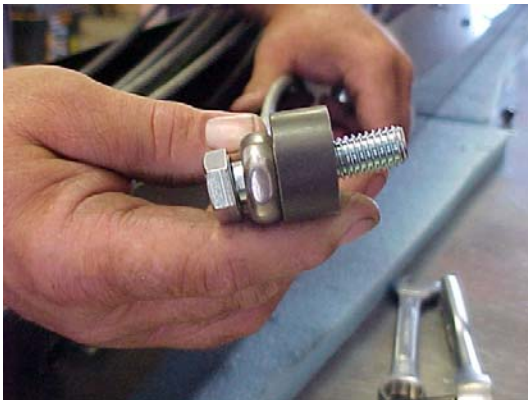
On the other end, wrap the cable over the pulley so it comes underneath. Repeat this process until the eye of the cable ends up at the top end of the Auto-belay™.

Step 10



This is what the cable should look like after it is correctly placed through the AutoBelay™ system. Make sure the eye of the cable ends up at the top end of the auto-belay at the opposite side of where you started.

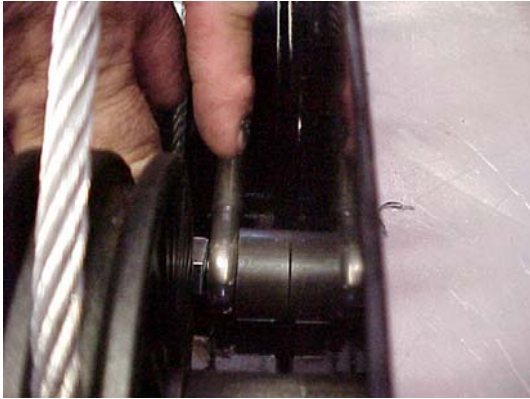
Step 11



At the top end of the Auto-belay™ remove the bolt with a wrench located on the front, lower right hand side of the box. Bolt and place the Auto-belay™ cable eye through spacer.

Step 12

12



Locate and Place the bolt back into its existing hole.

Step 13



Place the washer and nut back on the bolt and tighten down the bolt. Make sure when you tighten down the bolt that the cable's eye is parallel with the box and not kinked at an angle.

DETAILED DESCRIPTION OF INSPECTION ITEMS

Inspect the climbing wall thoroughly before you take it out to use it. Your safety during setup and your climbers' safety depend on it!

- **Auto-belay™ cable**

Check the cable for fraying, broken strands, kinks, wear or damage. Run your hands along the entire length of the cable, checking for a wavy or uneven feel to the cable. We recommend wearing leather gloves when checking the cable. If you hit a broken strand or frayed section of cable, it can hurt your fingers! **ALWAYS REPLACE YOUR CABLES EVERY YEAR, NO QUESTIONS ASKED. YOU, YOUR STAFF, AND YOUR CLIENTS DEPEND ON IT!!**



CAUTION: Always replace any suspect cable. This is absolutely critical for safe operation! If you suspect a cable is damaged, or are not sure, visit our tech page at www.extremeengineering.com or call Customer Service for assistance before operating the system!

Only order Extreme Engineering certified cables. We use the highest grade American cable available.

- **Auto-belay™ pulleys**

Make sure the cables are traveling through the pulleys without binding.

Make sure all the pulleys are turning smoothly and are not worn.

- **AutoBelay™ system**

Inspect the AutoBelay™ system thoroughly for wear in the pulleys or cables. Call Extreme Engineering for assistance in ordering and replacing pulleys and cables. Replace lock nuts after any AutoBelay™ servicing.

Make several climbs on the Extreme Engineering climbing wall. Be sure that the cables retract smoothly, and your descent is smooth, without any halts or jerky motion.

- **Hydraulic Hose**

Make sure the hose isn't leaking. If you find a leak, call Extreme Engineering for assistance.

- **Air Tank**

Make sure the pressure in the air tank is at the correct pressure, 60 to 65 PSI with the cable extended, or as otherwise marked on the tank.

- **Wall lift system (if applicable)**

Raise and lower the wall. Make sure the wall lifts smoothly and completely. If the wall does not raise or lower completely, or there is any hesitation in its motion, contact Extreme Engineering.

Check that all connectors on the hydraulic lift pump are properly tightened (control cable, power, and ground). Tighten if necessary.

- **Jacks (if applicable)**

The Extreme Engineering climbing wall has a total of four: the two outrigger extending jacks, and the two front jacks.

Let out each extending jack as far as possible and clean the inner ram tube. Coat the tube with a light coat of silicon spray lubricant.

- **Trailer Hitch (if applicable)**

Make sure the trailer hitch is operating correctly. Make sure the trailer hitch lock locks down the hitch to the ball securely, and that it cannot be popped off without first loosening the hitch lock. Inspect the safety cable and its mounting hardware for wear. If at all questionable, replace it.



CAUTION: If you are in any doubt whatsoever about the hitch or the safety cable, consult an automotive or RV service center. This is critical for safe transport! Should the trailer become unhitched during transport, this can be a catastrophic hazard!

- **Trailer tongue (if applicable)**

Make sure the bolts holding the trailer tongue to the trailer are tight.

- **Trailer wheels (if applicable)**

Make sure the lug nuts are tight.

- **Trailer lights/Emergency Break Away Cable (if applicable)**

Connect the trailer light and brake connector to a towing vehicle. Be sure the taillights, brake lights, running lights, emergency break away cable, and turn signals are performing correctly.



CAUTION: Replace any broken or burnt-out bulbs. Keep spare bulbs on hand. Transporting the trailer with any manufacturing lights – even for a short distance – can be a serious hazard!

Check the tow vehicle for a blown fuse, and replace it if necessary. If replacing a fuse or bulb does not correct the problem, then replace the trailer/brake light connector, which is of the standard RV type. If this does not solve the problem, contact Extreme Engineering

Check for broken light lenses and replace if necessary.

- **Loose or broken parts**

Inspect the entire climbing wall for loose or broken parts. Replace broken parts and tighten loose parts (call Extreme Engineering to order).

- **Keeper pins**

Keeper pins and safety snap pins are of the standard RV type. Keep spares on hand. Only replace with equal quality.



CAUTION: For both use and transport, never “jury-rig” your equipment with anything other than the correct keeper pins or safety snap pins! Doing so could create a serious hazard!

- Protect your harnesses from constant direct sunlight and heat and from nylon-damaging substances such as acids, alkalis, oxidizing agents, and bleach.

- **Carabiners**

Make sure the carabiners are lock properly. All surfaces of the carabineers should be free of cracks, sharp edges, corrosion, burrs, or excessive wear. Be sure the gate and any locking mechanism closes freely and completely. Gate opening and closing should be quick and easy. If washing and drying does not remedy a gummed-up carabiner, replace it. Rivets should not be bent, loose, or missing. Replace carabiners no more than 5,000 cycles (4 months), or sooner, if they are worn.



CAUTION: If a carabiner does not pass inspection (even after cleaning), destroy and replace it with a new one. This is absolutely critical for safe operation. Always keep a spare carabiner on hand.

PERIODIC MAINTENANCE CHECKLIST

Thoroughly inspect the climbing wall before every use.

- ❑ **Do the per-use maintenance checklist first.**
- ❑ **Loose or broken parts.** Replace broken parts; tighten loose parts.
- ❑ **Trailer hitch (if applicable).** Be sure the hitch, hitch lock, and light/brake cable all are operating correctly. Be sure the safety cable is OK.
- ❑ **Trailer tongue (if applicable).** Make sure the bolts are tight.
- ❑ **Trailer wheels (if applicable).** Make sure lug nuts are tight.

- ❑ **Trailer electric brakes (if applicable).** Check for correct operation of the brakes and breakaway switch.

- ❑ **Jacks (if applicable).** Extend all jacks and clean inner ram tubes. Coat with silicon spray lubricant.

- ❑ **Wall lift system (if applicable).** Be sure the wall lifts smoothly. Check that connectors on the hydraulic lift pump are tight (control cable, power, and ground). Tighten if needed.

- ❑ **Battery (if applicable).** Check terminals for corrosion; clean if needed.

- ❑ **AutoBelay™ system.** Cable slack is taken up, and paid out correctly. Also make sure that the cable is free of broken strands, corrosion, rust, frays, or any other defects.

- ❑ **Clean wall and trailer (if applicable).** Wash with soap and water, or spray at a car wash, treat like a boat or camper.

MAINTENANCE LOG

Use this log to keep a record of maintenance activity not covered by the inspection checklists. This might include parts replacement, calls to Extreme Engineering, etc.

Date	Description

SAFE TOWING TIPS (if applicable)

We encourage you to be a safe, courteous driver when towing your climbing wall. Keep the following in mind when towing your wall on public streets.

- Be sure that the lug nuts are tightened.
- Be sure to use the safety cable at all times.
- Be sure the tail lights, brake lights, and turn signals are functioning correctly.
- Be sure the trailer's brakes are working correctly.
- Be sure your trailer is properly registered with your state motor vehicle department.
- Always observe the posted speed limits for trailers when towing your climbing wall, and be especially cautious (and reduce your speed) when encountering windy, snowy, or rainy conditions.
- Install extended side rear view mirrors on your towing vehicle. Your climbing wall is over 24 feet in length and you'll need the mirrors to see traffic directly behind you.
- Signal before changing lanes. When you change lanes, be aware of traffic behind you and at your sides. Allow plenty of clearance before changing lanes.
- Do not attempt to make tight left or right turns.
- Practice backing up where there is plenty of room before you try it in a real-life situation. (As with any trailer, turn the steering wheel the opposite direction of the direction you want the trailer to move).

For more technical information on Extreme Engineering's products you can download the operating manuals on our website at www.extremeengineering.com. Click on Technical Support for manuals and additional product information.