

Inspection, Operation, and Maintenance Procedures

Definitions:

Anchor: A solid object such as a tree, pole or tower to which a cable may be secured.

Cable Avenue: The area of ground over which the zip line cable traverses.

Competent Person: A person possessing the skills, knowledge, experience, and judgment to perform assigned tasks or activities satisfactorily as determined by the employer.

Equipment User: Any person utilizing the zip line or Riding Gear such as a participant riding the zip line.

Riding Gear: Combination of the harness, lanyard, carabiner, trolley, helmet and/or any other equipment employed to transport, protect and secure the Equipment User to the cable.

?Sheave: A wheel or roller with a groove along its edge for holding a cable.

?Termination Hardware: The hardware used to affix one end of the zip line cable to the Anchor.

Torque: To rotate or twist.

Zip Line: A rigging system that allows a person or object hanging from a trolley to travel, propelled by gravity, from one point to another across an inclined cable.

1) Inspection/Testing

Your zip line equipment needs to be inspected and tested periodically to mitigate the risk of failure due to corrosion, normal wear, improper use or other factors. In this section we will describe the inspections that must be performed annually and before each session of use.

1.1 Before Each Session of Use.

Follow these steps immediately prior to using the zip line.

1.1.1 Anchors

Visually inspect the Anchor to which the cable is attached. If a tree is used as the Anchor, assess the health of the tree; never anchor the zip line to a dead or dying tree. If damage to the tree is anywhere observed, a closer examination may be necessary to assess the structural integrity. Move the zip line to another location if the strength of the tree has been compromised. If a pole is used as the Anchor, visually observe that the pole is aligned vertically and has not shifted from its original installed position. Other anchor types should be inspected as is appropriate to the application.

1.1.2 Terminations

The cable terminations, cable slings, eyebolts and turnbuckles should all be physically and visually examined for wear, proper configuration and adjustment. All the nuts and bolts of the cable clamps, turnbuckles and eyebolts should be checked using a wrench to be sure they have not vibrated loose or been tampered with. The distance between the face of the tree and apex of the cable sling should be not less than the radius of the Anchor tree or pole. When an eyebolt is used, pay special attention to the reverse side. Any signs that the eyebolt is pulling through the Anchor should be immediately addressed. If this is the case, a larger washer and/or metal plate should be used.

1.1.3 Cable

Visually inspect the cable itself. Walk the entire length of the ride looking for damage to the cable, kinks, twists, abnormal amount of sag, excessive corrosion, foreign objects, etc. If any of the above are found, the problem should be resolved and/or the cable replaced as is necessary *before* an Equipment User is allowed on the zip line.

1.1.4 Riding Equipment

Check the Riding Gear for improper configuration, damage, fraying, bending, tearing, cracking, slipping or other characteristics which would indicate that the items performance and/or strength have been compromised. Make special note of the following:

- ❖ Trolleys – Spin the wheels to check for excessive friction or roughness. Check the inside of the housing for excessive wear from cable rubbing (more typical for a trolley used in combination with bungee brakes).
- ❖ Handlebars – Take one grip in each hand and twist firmly in opposite directions to check for rotation or slipping. A handlebar with one or more loose grips should be retired IMMEDIATELY.
- ❖ Carabiners – Check that the gate properly closes and the locking mechanism operates without fault. Check for excessive wear at the points of contact between the carabiner and the trolley.
- ❖ Cobra Seat – Inspect the entire length of the rope, especially the spliced end, for fraying, broken threads, abnormal twists, and slipping. Check the wood seat for cracking and the knotted end of the rope for tightness. Additional accessories such as a handlebar or harness should NEVER be attached to the spliced eye or through open strands on the rope. Attachments should always be clipped directly to the trolley.
- ❖ Harnesses – Examine all straps, tie-in-points, stitching, and buckles for abrasion or unraveling to ensure faultless operation. Lanyards should NEVER be attached to a gear loop or any other location on the harness other than the main tie-in loop.
- ❖ Lanyards – Survey for excessive wear and loose stitching.
- ❖ Bungee Cord – Measure the overall length of your cordage without tension to ensure that the cordage is retracting back to it's original length. Most scenarios use a 20' or 30' cord which, when measured from loop to loop, will be 17' or 27' respectively (roughly 3' of cord is used when tying the knots). A bungee cord should be retired when it no longer retracts to within 15% of it's original length. In addition to measuring the length, a visual and physical examination of the bungee cord should also be completed. Check for abrasions on the outer sheath, irregularities in the diameter of the cordage and the integrity of the knots at each end. Retire the cordage immediately if issues are anywhere observed.

1.1.5 Weight Test

A weight test should now be performed. Follow the steps below.

- a. Attach a heavy load (not a person), equal to the weight of the heaviest expected Equipment User, to the cable using a lanyard or rope and the zip line trolley.
- b. Bounce the test weight up and down at the middle of the cable several times so the cable experiences the maximum stress possible.
- c. Detach the test weight and recheck the cable clamps, turnbuckles, cable slings, eyebolts, cable termination and cable anchors for proper torque, arrangement and integrity.
Continue only if the above steps have been performed without issue.

1.2 Before Each Season of use

In addition to the per session inspections, the following inspections must be made annually, or at the beginning of each season of use.

- ❖ Riding Gear – Similar to the cable weight test, each piece of riding equipment should be dynamically weight tested at a safe distance from the ground.
- ❖ Torque Ratings – All nuts and bolts in the system should be checked for tightness and adherence to recommended Torque ratings where applicable.
- ❖ Cable – The entire length of the main cable should be closely examined and replaced in the event of finding loose wire strands, excessive flattening, or excessive corrosion.

2) Operating Instructions

In order to operate your zip line safely it is essential to have an established safety protocol that all Equipment Users and operators are aware of.

2.1 Gear Configuration

Riding Gear such as a seat, handlebar or harness should be attached to the trolley via a carabiner. Each accessory should use its own dedicated carabiner and each carabiner ought to be attached only to the primary clip-in point of the trolley.

2.1.2 Equipment Users should securely attach, seat themselves, or grip the handlebar as is appropriate to the Riding Gear used.

- ❖ Handlebar – Firmly grip the bar with both hands. Before every ride, give the handlebar the 'twist' check described in 1.1.4

- ❖ Seat – Pass the wooden seat between the legs of the Equipment User and allow the rope to extend up through the legs to the trolley. Make sure the rectangular seat is oriented perpendicular to the legs, across the buttocks.
- ❖ Harness – Put the harness on and adjust the straps for a firm fit. A lanyard ought to then be fastened to the harness by threading it through the front tie-in point and passing the end of the lanyard back through itself (cow hitch). Optionally a carabiner may also be used to attach the lanyard to the harness. Complete the connection by using a carabiner to secure the upper end of the lanyard to the trolley.
- ❖ Carabiners – after clipping to its application and having its locking mechanism engaged, every carabiner should be given the squeeze test; grab the carabiner and squeeze to ensure that the gate is securely locked
- ❖ Trolley – check to ensure the trolley is straight upright and the wheels are centered on the cable

2.2 Loading the Cable

By gently lowering himself or herself into the Riding Gear and lifting their legs Equipment Users should allow the cable to take their full weight BEFORE descending down the zip line. This is the final 'test' to ensure that the Riding Gear is configured correctly before leaving the platform. This may require a second person to hold the Equipment User in place over the platform. NEVER 'jump' from a ladder or platform onto the zip line. Twenty feet off the ground is a very bad place to find out your gear was not configured correctly, additionally the action puts unnecessary strain on the entire system.

2.3 Dismounting

After coming to a complete stop the Equipment User may dismount from the cable by taking their weight off the cable and riding (onto a ramp, platform, the ground, etc) and un-clipping from the trolley or dismounting from the seat. Be aware that a zip line will 'spring back' when unloaded, so make sure any gear still attached (particularly a seat) is removed or raised up slowly to avoid impacting an Equipment User or operators. Returning the trolley back to the beginning of the zip line can be achieved in several ways.

- ❖ Connect a short length of rope to the trolley and use this as a return line. Do not leave the rope attached while descending down the cable as the dragging rope could become a hazard.
- ❖ Most trolley designs can be easily detach from the cable by un-clipping the carabiner which locks it in place. Once detached, the trolley and Riding Gear can be carried back to the beginning of the zip line.

2.4 Tips

- ❖ When a harness or seat is used it is helpful to station a Competent Person with a short rope at the end of the ride who can assist with dismounting. After the Equipment User has come to a stop the rope may be thrown over the cable and the Competent Person can apply their weight in order to bring the cable closer to the ground or landing platform. Once the cable is low enough that it is no longer supporting the weight of the Equipment User, un-clipping the harness from the trolley or dismounting from the seat becomes an easy task.
- ❖ For longer distances or cables which traverse difficult terrain, having more than one set of Riding Gear allows multiple Equipment Users to cycle through the ride much faster. After the first Equipment User detaches him or herself from the cable the next Equipment User can zip down while the first Equipment User returns to the beginning of the zip line. Make sure a communication protocol is in place to make sure the line is clear before the next Equipment User proceeds.

3) Maintenance

In addition to undergoing regular inspections, all removable Riding Gear and bungee cordage should be removed and stored indoors at the end of each session.

For trolleys not easily removed from the cable it is advisable to lock the trolley in place on the cable to prevent unauthorized use. A standard bike cable lock between the trolley and turnbuckle works well for this.

4) Warnings

Children should never be allowed to use the zip line without adult supervision.

Never place more weight on the cable than the line has been tested for (see 1.1.5 Weight Test). Never place more than 350lbs on the cable regardless of what test weight was used unless the zip line has been specifically engineered for a greater load. If you have pieced the cable, hardware and Riding Gear together *à la carte* (not a kit package) the maximum safe load may be less than 350lbs.

Riding Gear which is *worn* (harnesses, helmets, gloves, etc) should be put on and properly adjusted while still on the ground. Do not attempt to switch sets of Riding Gear between Equipment Users or put on a new set while standing on the launching platform, tower, tree house, etc.

Never use a ladder as the launching platform. If a launching platform is required for your location and it has not yet been installed we recommend that Equipment Users mount on the cable at the low point (middle). The Equipment User can grip the end of a rope while a Competent Person pulls them to the beginning of the zip line at which point the Equipment User may let loose of the rope and allow gravity to zip them down the cable.

Do not attempt to dismount from the cable while still in motion except possibly when dropping into a body of water.

Never allow more than one Equipment User on the cable at any time unless all of the following criteria are met.

- ❖ All Equipment Users are wearing a harness.
- ❖ A weight test has been done on the cable up to and/or exceeding the weight of the combined Equipment Users.
- ❖ The Equipment Users are tethered together with a short lead to keep them from becoming separated as they advance down the cable.

The Cable Avenue should be kept clear of people, animals, and other foreign objects while in use.

Equipment Users should be instructed to never reach up to grab the trolley wheels or cable while in motion.

A rope or similar tether should never be allowed to drag behind the trolley or Riding Gear while the Equipment User is descending down the cable. A rope may be used to retrieve the Equipment User or return the trolley to the starting position.

Ensure that clothing, long hair, harness straps and other such objects are tied down and unable to flap upwards and contact the cable or trolley.

Product Disclaimer

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1. Get proper training and instruction regarding its correct installation and safe use.
2. Ensure proper oversight, supervision and instruction (including the use of appropriate safety equipment) for themselves and others using the equipment.
3. Ensure all equipment is properly maintained and inspected for damage or wear prior to each use.
4. Assume all risks and accept full responsibility for any damage or injury, including death, that may arise from its use.

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